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ABSTRACT

The Prescriptive Mathematics Inventory (PMI)-Level B and a Pupil identification Form (PID) were administered to 22,055 sixth graders in Texas. Results from the PMI are reported in terms of the percentage of students marking the correct response for each of 209 objectives. Panels of mathematics teachers and of mathematics experts rated 40 of these objectives as "basic"; this report summarizes the basic objectives and gives the percentage of sixth graders mastering the objective as shown by the PMI. In addition, students' performance on each of the 209 objectives was analyzed on the basis of pupil characteristics obtained through the PID and according to the characteristics of the schools they attended. Results showed wide variations in achievement of objectives; for each objective, wide variations in performance were found among pupils of various ethnic groups, among students of schools serving communities of various sizes and types, and between pupils having high and low educational emphasis at home. Possible uses for this report are suggested. (Author/DT)

SIXTH GRADE MATHEMATICS

A NEEDS ASSESSMENT REPORT

Texas Education Agency

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FOREWORD

As a part of its continuing effort to assess the educational needs of Texas pupils, the Texas Education Agency tested over 22,000 sixth graders with criterion-referenced mathematics and reading tests in the fall of 1971. Although assessment information was obtained on regional and state bases, a major purpose of this activity was to provide classroom teachers with information on individual students which could facilitate instructional planning.

This study and the resulting reports will be evaluated in terms of their usefulness in assisting educational leaders in improving the quality of Texas elementary and secondary public schools.

If you have questions about the study or desire further clarification on some feature of this report, please contact

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ACKNOWLEDGEMENTS

Virtually all of the schools invited to participate in this assessment study agreed to take part. This cooperation permitted the sample pupil population to be very close to that projected in the sampling plan as being representative of each education service center (ESC) region and the state.

Credit for the successful completion of this study can be attributed to the assistance of the ESC and school personnel. The staffs from participating schools undertook the tasks of administering the assessment instruments and returning them for scoring, and the ESC guidance coordinators devoted a large amount of their time to serving as liaison between participating schools and the Texas Education Agency. The interest and enthusiasm of the staff of CTB/McGraw-Hill, Inc. in revising and developing instruments for this assessment was also an important contribution to the study.

A final word of thanks should be expressed to the various educators who served on different panels for the mathematics assessment. Two different groups assisted with the review of the mathematics objectives to determine the "basic" objectives described in the report. Also, a third panel reviewed the preliminary text of this report and provided many helpful suggestions for revisions.

ABSTRACT

In the fall of 1971, the Prescriptive Mathematics Inventory (PMI)-Level B and a Pupil Identification Form (PID) were administered to 22,055 pupils enrolled, at the sixth-grade level, on a representative sample of Texas campuses.

Results from the PMI are reported in terms of the percentage of pupils marking the correct response for each of 209 objectives. Each correct response reflects achievement of a mathematics objective. The objectives were derived through content analysis of mathematics textbooks. The PID asked each pupil to indicate his sex and ethnicity, to respond to several items regarding the educational emphasis of his home, and to indicate whether he feels he is good in arithmetic and whether he feels he is good in reading.

Panels of mathematics teachers and of mathematics experts were asked, independently, to rate the objectives as "basic" or as "desirable"; those objectives selected as "basic" are presented in the report.

Since presentation of the item used as the measure of achievement for each of the 209 objectives would be voluminous, 21 objectives were selected as representative. The item for measuring the achievement of each representative objective is presented in this report.

In addition, the pupils' performance on each of the 209 objectives of the PMI was analyzed on the basis of pupil characteristics (obtained through the PID) and according to the characteristics of the campuses on which the pupils were enrolled.

Wide variations in achievement were found among the objectives-22 were achieved by less than 2% of the pupils but 14 of the 209 objectives were achieved by at least 70% of the pupils. Approximately one quarter of the objectives were achieved by at least half the pupils; another quarter were achieved by less than 10% of the pupils.

For each of the objectives, wide variations in performance were found among pupils of various ethnic groups, among pupils from campuses serving communities of various sizes and types, and between pupils from homes having high and low educational

emphasis. On half of those objectives achieved by at least 10% of the pupils, the percentage of achievers among the "Other" (primarily Anglo) pupils was at least double the percentage of achievers among the Black pupils. The general pattern was for pupils on campuses serving suburban communities to have the highest percentage of achievers, followed in order by those on campuses serving cities of less than 200,000 population, rural areas, cities of 200,000-500,000 populations, and cities of over 500,000 population. Pupils on campuses not participating in Title I, Elementary and Secondary Education Act, evidenced only a slightly, but consistently, superior performance on the objectives. On most of the objectives the girls had a higher percentage of achievement than the boys. Interesting departures from the predominant performance patterns described above were found in the case of some objectives.

Chapter VI describes possible uses of the report. The percentage of pupils who should be able to give the correct response was not established for each objective. The causes underlying high or low performances on the objectives were not identified. The report is an assessment of the status of pupils at the beginning of the sixth grade. The report should not be construed as an evaluation of the effectiveness of sixth-grade instruction nor should the pupil categories by which data is reported be regarded as "causes" of high or low performance.

TABLE OF CONTENTS

TABLES AND FIGURES

TABLES AND FIGURES (cont.)

APPENDICES

I. INTRODUCTION

The 1971 Texas Assessment of Reading and Mathematics is one of a series of assessment studies being conducted by the Texas Education Agency with the cooperation of regional education service centers and schools. These studies are a part of the Long-Range Plan for Needs Assessment (see Appendix A) in Texas that has the purpose of establishing the status of students in reference to the Goals for Public School Education in Texas.

After consultation with various groups of educators, reading and mathematics were chosen as priority areas of concern in which to determine the relationship between the students' status and the Goals.

RATIONALE

Developing the competencies of students in reading and mathematics has long been a goal of all public schools because student mastery of skills and concepts in these two areas is considered a prerequisite for attaining other student development goals. Little information about student performances in relation to specific reading and mathematics skills and concepts has been made available to curriculum planners at the local, regional, or state levels.

This study also provides evaluative information about mathematics objectives that can be considered "basic" for students to master in order to function in society, as distinguished from those objectives that are "desirable" for some students to master.

OBJECTIVES

The objectives for the 1971 Texas Assessment of Reading and Mathematics follow:

- To provide educators in participating schools useful information about the performances of their pupils relative to specific skills and concepts in reading and mathematics. The degree to which this objective is met will be determined

through the use of questionnaires presented to school personnel.

- To develop through the use of criterion-referenced testing a more universal understanding of, and a positive attitude toward, the use of this diagnostic and prescriptive information with students. Evaluation of the accomplishment of this objective will be measured through the use of questionnaires sert to teachers.

- To develop sets of basic objectives for the areas of reading and mathematics that will be useful for program planners and can serve as benchmarks for later assessments. The degree to which this objective is accomplished will be determined by surveying educational planners.

- To furnish regional education service center (ESC) personnel with summary information about the performances of pupils in their regions relative to specific skills and concepts in reading and mathematics. The usefulness of this information will be determined from personal interviews with ESC personnel.

- To furnish Texas Education Agency personnel with state summary information about the performance of pupils on a selected set of reading and mathematics objectives. The usefulness of the state summary information for Agency divisions will be evaluated through structured interviews with staff members within the divisions.

- To disseminate information from the assessment that will be useful for

  .. pre-service and in-service teacher education programs

  .. up-dating educational programs for reading and mathematics including programs for different population groups

.. planning programs to alleviate educational needs.

Follow-up evaluation forms will be used to determine whether the assessment reports have reached appropriate audiences, and if so, how the information is used.

II. PROCEDURES

DECISIONS ABOUT THE NATURE OF THE ASSESSMENT

Pilot study - During the spring of 1971, a pilot study was conducted in one region of Texas to determine whether or not the proposed reading and mathematics assessment instruments would yield results that were useful to teachers for the classroom instruction of pupils. Also considered was whether results from these same instruments would produce summative information that could be used by personnel in regional education service centers and the Texas Education Agency. The pilot study was used to evaluate the methods of communicating about assessment information, delivering assessment materials, and returning test results to schools. Teachers in the schools that participated in the pilot study were surveyed to determine their perceptions about the assessment results and the usefulness of the information they received from the tests for classroom planning.

An evaluation of the methods and instruments used for conducting the pilot study and the survey about the usefulness of test results for classroom instruction showed some changes should be made for the statewide assessment. Two major alterations were made. A criterion-referenced reading test was developed for the statewide assessment project since the standardized diagnostic reading test did not yield enough information about pupil mastery of specific skills and concepts. A grade level instead of an age group of students to be assessed was selected because most schools have students grouped by grades.

Students to be assessed - The students that would participate in the assessment project would be those at the sixth-grade level. This level of the pupils' educational experience was chosen for assessment because at this point in the pupils' progress through school they would have been exposed to most of the basic skills and the usual tendency for some students to drop out of school would not have begun. It was assumed, then, that by assessing the performances of sixth graders a better representation of pupil performances would be obtained.

Developing an assessment sample - The Texas Education Agency wanted the information that was collected to serve a dual role of assisting in instruction in the classroom as well as providing a statewide assessment. The sampling procedure chosen was that of selecting a sample of schools representative of the state and then assessing the total sixth-grade population in these schools.

Selection of assessment instruments - Part of the rationale for conducting the assessment was to determine pupil performances in relation to a common set of specific objectives for both the areas of reading and mathematics. It was decided that the information from a testing program that reported results in terms of a comparison of pupils would not provide enough specific information for curriculum planners to use in renewing or developing programs. As a result, criterion-referenced test instruments were chosen for the study because this type of testing is designed to measure the relationship between stated objectives and student mastery of these objectives. In order to gather additional information about students that could be combined with the students' test scores for further analysis of the assessment results at the state level, a one-page questionnaire was developed to be administered with the test instruments.

Administration of assessment instruments - The test instruments and the one-page questionnaire were administered by the staff of each school that participated in the assessment study. No special arrangements were made by the staff of the regional education service centers or the Texas Education Agency to administer the tests in schools. Since the tests were designed as "power tests" (tests to measure a level of performance unaffected by the speed of response, so no time limit is imposed), it was recommended, at pretest workshops and in literature sent to schools that the tests be administered during the regular class time scheduled for mathematics.

Selection of mathematics objectives - It is impossible to assess the performance of students in every skill or concept area for mathematics, so a selection procedure was used. The objectives for mathematics were chosen from the major skill or concept areas treated in the state-adopted textbooks. The textbook analysis and objective writing tasks were performed by the test contractor. These objectives were then reviewed by the mathematics consultants at the Texas Education Agency

and adapted for use in this assessment study. In addition, in order to gain further insight about the objectives, it was decided to start to develop a listing of mathematics objectives that could be considered to be "basic" or "desirable," that could be used in later assessments, and that would be useful for the development of objectives under the Goals for Public School Education in Texas.

THE ASSESSMENT INSTRUMENTS

The Prescriptive Mathematics Inventory - Level B (PMI-B) - This criterion-referenced mathematics test published by CTB/McGraw-Hill was chosen for this assessment. The PMI-B was designed to measure student mastery of 212 mathematics objectives in 33 general areas of mathematics. The objectives were derived through an analysis of the major series of mathematic textbooks that are used in schools including the five series of textbooks on the state-adoption list in Texas. They include skills and concepts usually covered in mathematics to the end of the sixth-grade level. For the PMI-B one test item is used to measure mastery of each objective. A type of open-ended response to the test items is incorporated into the test design to help eliminate guessing since the one-to-one ratio of item to objective is used. The students write their responses to items on a space in the answer grid and then code their answers for scoring purposes. This test has no time limit and is designed to be administered in the classroom during the regular period for mathematics instruction. The PMI-B was administered to 22,055 sixth-grade students through this assessment study.

The Pupil Identification Form (PID) - A one-page form developed by the Texas Education Agency was used in this study in order to gather additional demographic data about students that were not requested in personal data sections of the test. Also, the PID included some perceptional questions for students to answer. The information collected through this form was combined with the students' test scores to provide additional variables for the analysis of the assessment data. Through use of the PID, the Migrant Education Section and the Special Education Division of the Agency were able to gather some information about students in the assessment enrolled in their programs. Some of the results from questions asked on the PID have not been reported separately but were combined to form an Educational Emphasis Index. The teachers were asked to verify the students'

responses to the ethnicity, migrant program, and special education program questions but were not asked to check the other questions about student perceptions. (A PID form is shown in Appendix B.)

SAMPLING

The desired sample of campuses was to be representative of the Texas campuses which offered instruction at the sixth-grade level. All pupils to whom instruction in mathematics was given at the sixth-grade level on the selected campuses were to be tested.

The statewide sample of campuses offering instruction at the sixth-grade level was to consist of 20 subsamples, one for each of the 20 education service center regions of the state. Each of the 20 regional samples was to contain approximately

- 10% of such campuses in the region
- 10% of the sixth-grade pupils in the region
- the same ethnic distribution of sixth-grade pupils as the region
- the same proportions as the region of campuses from large cities, small cities, towns, suburbs, and rural areas, and
- the same proportion of sixth-grade campuses participating in Title I as in the region.

Procedure for sample selection - A list, by education service center region, was obtained of all Texas campuses which enrolled pupils, in the fall of 1970, at the sixth-grade level. The campuses of each of the 20 education service center regions were formed into 10 strata on the basis of (1) the size and type of community in which the campus is located, and (2) whether or not the campus participated in a Title I ESEA, program during the last school year. The size-and-type of community strata, a collapsing of the categories used in the USOE Program Reference File for the 1970-71 school year, were

- located in a city of over 200,000 population

- located in a city having between 50,000 and 200,000 population
- located in a town having less than 50,000 population
- located in a suburb of a city having over 50,000 population
- located in a rural area.

For each of the 20 ESC regions independently, every tenth campus from a random start was selected from each of the 10 strata. The process of stratified random sampling did not, for some ESC regions, yield a list of campuses whose sixth-grade pupils constituted approximately 10% of the sixth-grade pupils of their region, nor did some samples approximate the sixth-grade ethnic distribution of their region. Minimal substitutions of campuses within the region were made until

- at least 8% but not more than 12% of the sixth-grade pupils of the region were on the selected campuses, and
- the percentage which each ethnic group constituted of the selected campuses was within 5 points of the percentage which each ethnic group constituted of the regional population of sixth graders.

The obtained sample - A comparison of the population with the sample of campuses drawn from each ESC region--by size and type of community served by the campus and by participation of the campus in Title I, ESEA--appears as Appendix C. The appendix also compares the pupil population of each ESC region with the number of pupils who responded to the PMI. The regional test coordinators were very effective in obtaining the cooperation of the administrators of the selected schools. Awareness of the biasing effect upon the sample of substitutions led to almost all of the selected campuses administering the tests to their sixth-grade pupils. The departures were limited to loss of two campuses and to nine substitutions (most of which involved very small sixth-grade enrollments).

Approximately 10% of the Texas campuses teaching at the sixth-grade level administered the PMI and approximately 10% of the

pupils being taught at the sixth-grade level responded to the PMI.

The distribution of campuses on which the PMI was administered closely approximated the distribution of sizes and types of campuses in the state. Table A shows the number of campuses on which the PMI was administered and the number of pupils from whom PMI records were obtained.

TABLE A: Campuses Administering and Pupils Responding to the PMI, by Size and Type of Community in which Campuses are Located

	Number		
	Campuses		
Size and Type of Community	Title I	Non-Title I	Pupils
Large City (over 200,000)	18	37	6527
Small City (50,000-200,000)	16	18	3126
Town (less than 50,000)	53	23	7649
Suburb	6	11	2583
Rural Area	49	11	2170
All	142	100	22055

Table B compares the ethnic distribution of the sample of 22,055 responding pupils with the state's ethnic distribution of pupils at the sixth-grade level.

TABLE B: Ethnic Distribution of Respondents to the PMI and of State Enrollment at the Sixth-Grade Level

	Black	Mexican American/ Spanish surnamed	Other(Anglo,Oriental and American Indian)	Unknown
Respondents to the PMI	14.8%	19.2%	55.8%	10.2%
State enrollment at the sixth-grade level	14.8%	21.5%	63.7%	-0-

In each of the 20 ESC regions of the state, the respondents to the PMI constituted at least 7% and not more than 13% of the pupils enrolled at the sixth-grade level.

ANALYSIS OF THE ASSESSMENT DATA

Reporting results from criterion-referenced tests - Criterion-referenced tests are developed for the distinct purpose of determining the relationship between performance and objective. They are not normed tests so the usual reporting of results in reference to a population based on a "normal curve" is not relevant. Consequently, statistical terms that are often used to report results--such as stanines, percentile ranks, and other kinds of standard scores--cannot be used with the results from criterion-referenced tests. Group results derived from this type of testing procedure are usually reported in terms of the percentage of persons mastering the objective.

Reports furnished to schools that participated in this study - To provide useful information about students for classroom instructional purposes, each school that participated in this assessment was provided with the following kinds of reports for mathematics.

- Individual student reports:
  - A report for each student to show his status in relation to the mathematics objectives was prepared for teacher and student.
  - Another individual report grouped the objectives that the student did not master and gave page references in the textbook or workbook that might assist the student in gaining mastery of the objective.
- Group reports of student test results:
  - A school report that showed the percentages of sixth-graders in the school who mastered each mathematics objective was provided.
  - A class report was made for each teacher which gave the class percentage of pupils who mastered each objective.
  - Also provided was a report that grouped the students in each class by the objectives that their test performances indicated the

students were having difficulty in mastering, and gave pertinent page numbers in the textbook and workbook to assist the pupils with instruction in mastery of these objectives.

- Master Reference Guide:

  Each teacher was asked to furnish the name of the textbook that the school adopted from the state list that was used with the class. The teachers later received a guide that listed each mathematics objective with page references from the textbook that they listed. Master Reference Guides for the fourth-and fifth-grade levels for the same series of textbooks listed by the teacher were also made available.

REPORTING THE STATEWIDE DATA

The results used for this report were derived from information supplied by the testing company and from additional analysis of the data done by the Texas Education Agency. The information furnished by CTB/McGraw-Hill was compiled through totaling the results from the sample of schools into regional grouping and then summing the 20 regional groups for the state results. These results included a state percentage of students who had mastered each mathematics objective, and separate reports for each item on the Pupil Identification Form giving the percentages of mastery in relation to the students' responses on this form. Further processing and analysis of the information was done by the Agency after receiving the computer tapes from the test company. The following is a brief description of the analysis plan followed by the Agency.

Analysis plan - This study was not designed to identify the factors underlying pupil performance. The analyses do, however, compare the performance status of

- male and female pupils
- Black, Mexican American, and "Other" (includes Anglo, Oriental, and American Indian) pupils

- pupils enrolled on campuses serving various sizes and types of communities: cities of over 500,000 population, cities of 200,000 to 500,000 population, cities of less than 200,000 population, suburban communities, and rural areas

- pupils enrolled on campuses receiving and not receiving funds from Title I, ESEA

- pupils who gave "Yes" and "No" responses to the PID question "Am I a good reader?"

- pupils who gave "Yes" and "No" responses to the PID question "Am I good in arithmetic?"

- pupils who obtained a high rating and pupils who obtained a low rating on an Educational Emphasis Index (described in the next subsection).

The information used for establishing these categories came from the Pupil Identification Form, from demographic items asked at the beginning of the test instruments, and from the test results. The results from the migrant program question on the Pupil Identification Form did not provide enough cases to form a basis for comparison and the question asking students about special education programs did not make enough distinctions among the types of programs.

The Educational Emphasis Index - Student responses to a series of questions asked on the Pupil Identification Form were used to establish an "educational emphasis of the home" index. This index was formed to study certain factors presented by the pupils' background. Four questions from the Pupil Identification Form were used to compile the Educational Emphasis Index and arbitrary weights were assigned for each response to the questions. See Table C.

TABLE C: Questions from the Pupil Identification Form Used for Compiling the Educational Emphasis Index and the Weights Assigned to Responses

Number and Question	Weight of Response
4. Outside of school, how long do I usually watch TV on each school day?	
(1) None	0
(2) 1 or 2 hours	1
(3) 3 or 4 hours	2
(4) 5 or 6 hours	1
(5) more than 6 hours	0
7. Do I read books for fun, even when they are not for school?	
(1) No	0
(2) Yes	2
8. How many books do we have at home?	
(1) We have no encyclopedias and less than 25 other books.	0
(2) We have no encyclopedias but we have 25 or more other books.	1
(3) We have some encyclopedias and less than 25 other books.	1
(4) We have some encyclopedias and 25 or more other books.	2
9. Do we get a daily newspaper, or magazines in the mail?	
(1) We get no newspapers and no magazines.	0
(2) We get no newspapers, but we get magazines.	2
(3) We get no magazines, but we get a daily newspaper.	2
(4) We get magazines and a daily newspaper.	4

The responses of students to these questions were summed according to the weights assigned for the responses. After listing the possible response scores on a continuum that ranged from a high of 10 to a low of 0, the number of students having each response score was compiled. The 15% of the students having the highest response scores was used to establish the "high educational emphasis" group and the corresponding percentage of students having the lowest response scores used in establishing the "low educational emphasis" group.

SELECTING REPRESENTATIVE OBJECTIVES FOR REPORTING

Presenting an analysis of pupil performance on every objective would cause this report to be too lengthy. A group of objectives representative of the total sets of objectives for mathematics was selected. The objectives that were selected are discussed in Part IV - Results on a Representative Group of Objectives.

In order to ensure the representativeness of the objectives, certain procedures were followed which involved the use of some mathematical formulas to establish the sensitivity of each objective to the analysis categories used in this study. The term "sensitivity" is used here to mean the extent to which performances on each objective vary among categories of the analysis plan, e.g., ethnicity. The objectives were ordered from least sensitive to most sensitive. (See Appendix D.)

It was decided that 10 percent of the mathematics objectives would be selected. To achieve a balanced sampling, the listing of objectives under general areas was used and each objective was identified as either being "basic" or "desirable." (See Part III of this report.) The sample selected was to represent approximately the same ratio of objectives by general areas and by "basic" or "desirable" as in the total set of objectives.

The mathematics objectives were blocked into groups of ten according to the order of their sensitivity to provide a 10 percent sample. This process resulted in 21 groups; one objective was chosen from each group. This objective was selected by consideration of the general area of mathematics it represented and whether it was "basic" or "desirable."

The relationship between all *209 measured objectives and the sample of 21 representative objectives can be seen, with respect to performance of ethnic groups, in Table D.

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* Because of errors in three test items, pupil performances are reported on 209 of the 212 mathematics objectives.

TABLE D: Number of PMI Objectives in Each Percentage Category of Mastery

Percent of Mastery	Black		Mexican American		Other(Anglo, Oriental, American Indian)	
	All Objs.	*Repr. **Objs.	All Objs.	Repr. Objs.	All Objs.	Repr. Objs.
75-99%	1	0	4	1	18	3
50-74	14	3	38	6	51	6
25-49	54	8	58	5	49	6
0-24	140	10	109	9	91	6

* Repr. - abbreviation for representative
** Objs. - abbreviation for objective

III. BASIC LEARNER OBJECTIVES FOR MATHEMATICS

A part of the assessment of mathematics involved an investigation to identify basic objectives. The purpose for this activity was to identify a set of objectives that could be considered basic -- i.e., pupils mastering this group of objectives would be able to function at the consumer level in society. The information about basic objectives and the status of the pupils in relation to these objectives can be used as benchmarks for planning at the local, regional, and state levels.

PROCEDURES FOR SELECTION

It was decided early in the assessment project to use the list of objectives that had been developed for the Prescriptive Mathematics Inventory - Level B as the master list for choosing basic objectives. This list was selected because the PMI-B objectives were written in measurable terms, and they included most of the mathematics curriculum content through the sixth-grade level that is taught in Texas schools.

The PMI-B objectives were then organized into a questionnaire format that listed the objectives and provided a scale by which a person could rate each objective. The options presented for rating each objective included the phrases "appropriate for all students," "appropriate for many students," and "appropriate for few students." The directions for the questionnaires explained that the point of reference for giving opinions about the objectives was a student at the sixth-grade level (usually an eleven- or twelve-year-old pupil). The objectives identified as "appropriate for all students" would be considered as basic objectives for mathematics.

Forms of this questionnaire were disseminated to two selected groups of educators. One group consisted of a sample of sixth-grade mathematics teachers randomly selected from those schools that had participated in the Assessment Project. Since the mathematics objectives review was included as a part of an evaluative survey to secure teachers' opinions about criterion-referenced testing, each mathematics teacher selected in the sample was sent a subset of all objectives for rating. The responses were then collated in order to compile the opinions of the mathematics teachers on all objectives.

A panel of mathematics experts which included supervisors, curriculum specialists, university professors, and other teachers from schools not participating in the assessment was selected by the staff in the Division of Program Development in the Texas Education Agency. This group of experts received the total list of objectives for their review and opinions.

The response "appropriate for all students" was assigned a weight of 1; "appropriate for many students," a weight of 2; and "appropriate for few students," a weight of 3. For each objective a mean was calculated from the responses given by each group of educators. An objective was deemed "basic" if its mean was 1.5 or less. Forty-two objectives were placed in the "basic" category by both the teachers and the mathematics experts. In addition to the objectives on which there was consensus, the teachers identified six more objectives as basic; the mathematics experts felt an additional 41 of the objectives were basic.

Of the six objectives identified as basic by the teachers but not by the mathematics experts, five were in areas of mathematics from which the experts did not select any objectives as basic. These areas are rounding numbers (estimation), identity element, and statistics (computing a mean). Otherwise the teachers and mathematics experts were in agreement on the major areas of mathematics from which objectives were identified as basic. The experts rated more of the objectives within these areas as basic. For instance, in the area of operations on the number line, the mathematics teachers rated one objective as basic; the mathematics experts agreed with teachers about this objective, but also selected an additional five objectives as appropriate for mastery by all students. The only areas in which the experts ranked objectives as basic and the teachers selected none were multiplication and division of positive fractions, and addition, multiplication, and division of decimal numbers. The difference between the two groups in the selection of basic objectives can perhaps be attributed to the differing perspectives of the groups. The teachers might have been more inclined to consider "basic" those objectives covered at the sixth-grade level and not to rate as "basic" those objectives they felt were too difficult for all or most of the sixth graders to master. The mathematics experts probably looked at the objectives from a broader frame of reference and paid more attention to what they thought would be basic for all students and were less cognizant of what was taught at the sixth-grade level.

RESULTS

The remainder of this section contains a summary of the basic objectives that were selected. The objectives were discussed under the general headings of the area of mathematics to which they relate. Also, the percentage of sixth graders in the assessment that mastered the objective is stated in parentheses. Appendix E lists each of the PMI objectives and gives the results for each group of reviewers.

Operations on the number line

The first area of mathematics described in the list of objectives involves operations on the number line. The two panels of reviewers agreed on one basic objective from this area: "when given a number line showing the operation of addition of whole numbers and an open mathematical sentence, the student should be able to complete the mathematical sentence to complete the operation" (49% of the sixth graders were able to do this). The panel of mathematics experts identified five additional objectives from this area as basic. These objectives require the students to be able to specify a given point on a number line divided into fourths as a mixed number (30%); and to use number lines that show the operation of subtraction of whole numbers (42%), the operation of addition of mixed numbers (8%), the operation of subtraction of mixed numbers (10%), and the operation of multiplication of mixed numbers (5%) to complete a mathematical sentence that describes the operations.

Addition of whole numbers

Both the mathematics teachers and experts agreed that the objectives given for the addition of whole numbers were basic for sixth-grade students. These objectives involved the students' being asked to add

- four-digit whole numbers with regrouping (66%)
- five-digit whole numbers with regrouping (75%)
- a column of five or fewer three-digit whole numbers with regrouping (67%).

At least two-thirds of the students tested answered the items correctly for these objectives.

Subtraction of whole numbers

All of the objectives listed for this area were selected as basic by both review groups. The objectives called for the same type of operation, subtraction of whole numbers with regrouping, but differed in the number of digits the student would be required to use. For instance, the students were asked to subtract with regrouping a two-digit number from a two-digit number (mastered by 76% of the sixth graders), a three-digit number from a three-digit number (70%), a four-digit number from a four-digit number (60%), and a five-digit number from a five-digit number (57%).

Multiplication of whole numbers

The mathematics experts and teachers agreed that 5 out of 12 objectives given for the multiplication of whole numbers should be considered as basic. The five basic objectives and the percentage of correct responses by the sixth-grade students to the test items measuring these objectives are as follows:

- Write a given repeated addition problem as a multiplication problem and compute the answer. (48%)
- Multiply a one-digit whole number by a one-digit whole number. (Basic fact) (66%)
- Multiply a two-digit whole number by a one-digit whole number. (78%)
- Multiply a three-digit whole number by a one-digit whole number. (62%)
- Multiply a four-digit whole number by a one-digit whole number. (53%)

The mathematics experts considered four additional objectives as basic for sixth-grade students.

- Find the total number of elements in a rectangular array by using multiplication. (82%)

- Multiply a two-digit whole number by a two-digit whole number. (59%)

- Multiply a three-digit whole number by a two-digit whole number. (40%)

- Multiply a three-digit whole number by a three-digit whole number. (32%)

Division of whole numbers

The review panels reached agreement about six of the objectives pertaining to the division of whole numbers. The operations cited for each of these objectives were similar in that each required the student to be able to divide one number by another number. The objectives differ by the number of digits in each number and whether or not the answer has a remainder. The six objectives viewed as basic by both groups require the student to be able to divide a two-digit number (73%) and a three-digit number (41%) by a one-digit number with no remainder. The objectives considered basic require division of a two-digit number by a one-digit number with a remainder (58%), a three-digit number by a one-digit number with a remainder (55%), a four-digit number by a one-digit number with a remainder (32%), and a three-digit number by a two-digit number with remainder (32%).

The panel of mathematics experts named two additional objectives as basic. The objectives are concerned with dividing a two-digit number by a two-digit number with a remainder* and dividing a four-digit number by a two-digit number with a remainder (33%).

Addition of positive fractions

Four of the nine objectives dealing with the addition of positive fractions were rated as basic by both the mathematics experts and teachers. These four objectives follow:

- Given a rectangle that has been divided into a number of equal squares of which some are shaded

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*Test item did not measure this objective.

the student will specify the fractional part of the rectangle that is shaded. (Pictorial fractions) (36%)

- Rename a fraction by reducing the numerator and denominator to lowest terms. (14%)
- Add three like fractions without regrouping. (75%)
- Add two like fractions with regrouping. (24%)

The following objectives were rated as basic only by the mathematics experts:

- Convert a fraction expressed in lowest terms into higher terms. (Equivalence) (24%)
- Add two unlike fractions without regrouping. (17%)
- Add two mixed numbers without regrouping. (16%)

Subtraction of positive fractions

Two of the five objectives dealing with subtraction of positive fractions were considered basic by both groups. The two objectives were concerned with subtracting like fractions without regrouping (48%) and subtracting like fractions with regrouping (9%). The mathematics experts selected two additional objectives as basic: subtracting unlike fractions without regrouping (13%), and subtracting mixed numbers without regrouping (9%).

Multiplication of positive fractions

The mathematics experts rated three of the eight objectives dealing with the multiplication of positive fractions as basic. The mathematics teachers did not list any of the objectives in this list as basic. The objectives the mathematics experts selected are:

- Multiply a proper fraction by a proper fraction. (38%)
- Multiply a whole number by a proper fraction. (22%)
- Multiply a whole number by a mixed number. (10%)

Division of positive fractions

The mathematics experts named two of these objectives as basic while the mathematics teachers chose none. The two objectives selected by the mathematics experts are to divide a proper fraction by a proper fraction (1%) and divide a whole number by a proper fraction (3%).

Addition of decimal numbers

Again, the mathematics experts selected several objectives from this area of mathematics as basic while the mathematics teachers selected none. The experts listed the following six objectives as basic.

- Convert a proper fraction to a decimal fraction. (3%)
- Add two decimal fractions each with one decimal place without regrouping. (67%)
- Add two decimal fractions each with two decimal places without regrouping. (63%)
- Add two decimal fractions each with three decimal places without regrouping. (57%)
- Add two decimal fractions each with one decimal place with regrouping. *
- Add two decimal numbers each with two decimal places with regrouping. (48%)

Subtraction of decimal numbers

The mathematics experts selected several basic objectives from this group; the mathematics teachers selected one. Both review groups chose being able to subtract a one-digit decimal fraction from a one-digit decimal fraction without regrouping as a basic objective (72% of the sixth graders were able to

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*Test item did not measure this objective.

do this). The mathematics experts named basic objectives that would require subtracting

- a two-digit decimal fraction from a two-digit decimal fraction without regrouping (63%)
- a one-digit decimal fraction from a decimal number with one decimal place with regrouping (43%)
- a decimal number with two decimal places from another decimal number with two decimal places with regrouping. (37%)

Multiplication of decimal numbers

None of the mathematics teachers rated the eight objectives for multiplication of decimal numbers as basic learnings for sixth-grade students. The mathematics experts, however, identified the following two as basic objectives for all students:

- Multiply a two-digit whole number by a one-digit decimal fraction. (40%)
- Multiply a two-digit whole number by a two-digit decimal fraction. (32%)

Division of decimal numbers

The review panel of mathematics experts selected one objective from this area of mathematics as basic. The objective they selected requires a student to be able to divide a two-digit decimal fraction by a one-digit decimal fraction (60% of the sixth graders met this objective). The review panel of mathematics teachers did not select any objectives from this group.

Negative integers

The sixth-grade students were asked to respond to test items measuring four objectives dealing with negative integers. Both the mathematics teachers and experts agreed that the students should be able to

- add two one-digit negative integers. (39%)

Rounded numbers (estimation)

Mathematics teachers selected one objective as basic from this group; the mathematics experts did not name any. The objective the teachers named would ask the student to use the process of estimation by rounding off a five-digit number to the nearest 10,000 (26% of the sixth graders did this).

Identity element

The mathematics teachers identified three of the four objectives covering identity elements as basic. The three objectives called for the student to be able to supply a zero as the identity element in an unfinished mathematical sentence involving the addition of whole numbers (71%), the number one as the identity element in an unfinished mathematical sentence involving the multiplication of whole numbers (56%), and a zero as the identity element in an unfinished mathematical sentence involving the addition of positive fractions (65%).

Measurement

This part of the objectives contained many everyday applications of mathematics that asked for the student to be able to use a variety of measurements. The review panels selected many of these objectives as basic. They did not reach a consensus on all the objectives selected, but there are several that are common to both groups. The objectives selected as basic by both groups are the following:

- being able to use a ruler to measure the length of an object (42%)
- the ability to add lengths expressed in inches and then convert the sum to feet and inches (31%)
- being able to look at an illustration of a liquid thermometer and then specify the temperature (38%)
- given an illustration of money that contains both bills and coins, being able to count the total amount (58%)

- the ability to add (61%), subtract (62%), and multiply (60%) expressed amounts of money

- given an illustration of a clock, being able to specify the time that is shown. (57%)

The review panel of mathematics experts named these additional objectives as basic:

- given an illustration of a ruler marked off into half units, being able to estimate the length of any given object to the nearest half unit (42%)

- when given an arbitrary unit of length (such as a map scale), being able to measure the length of another given object as a number of these units (28%)

- given a drawing of a rectangle with the dimensions marked, being able to compute the perimeter (5%)

- given a drawing of an area that has been subdivided into uniform squares, being able to find the area of the figure as the number of these square units (28%)

- given a line graph, the ability to convert liquid measures from gallons to quarts (38%)

- the ability to divide an expressed amount of money. (14%)

The panel of mathematics teachers selected as basic the objective of being able to add quantities of time expressed as hours, minutes, and seconds with regrouping (12%).

Place value

Of the eight objectives for place value, the mathematics teachers and experts agreed on only one objective as being basic to the sixth-grade level. This objective states that

- Given the expanded form of a three-digit numeral, the student will write the numeral (Expanded notation). (81%)

The mathematics experts selected two additional objectives as basic for place value. These are

- Given the values of the tens' and units' positions of a numeral, the student will write the numeral. (0-999) (81%)

- The student will specify the value of any digit in a five-place numeral. (1,000-99,999) (43%)

Non-metric geometry

Both review groups selected two objectives from this part of the list as basic:

- being able to select a drawing that represents a line segment (47%) and a drawing that represents parallel lines (41%) from a set of geometric drawings.

Percent

Only one of six objectives dealing with percents was considered to be a basic objective by both the mathematics teachers and experts. This objective states the following:

- the student will be able to convert a number written as a fraction with denominator 100 to percent form. (Denominator of 100) (27%)

Sets

From the list of objectives that dealt with mathematical sets, the review group agreed that two of the objectives were basic. The two objectives are

- when given a set of less than ten elements, being able to count the elements (94%)

- when given a set containing whole numbers as elements, being able to identify all elements that are "more than" or "less than" a given number. (85%)

The mathematics experts also selected as basic an objective that called for being able to distinguish from two finite sets, the set that is the union of these sets (22%).

Statistics

The mathematics experts did not rate either of the two objectives dealing with statistics on the PMI as basic. However, mathematics teachers rated the ability to be able to compute an average (mean) from a set of whole numbers as basic (20%).

IV. RESULTS ON A REPRESENTATIVE GROUP OF OBJECTIVES

A sample of the objectives was taken from the total group used with the Prescriptive Mathematics Inventory-Level B to facilitate the discussion of pupil performances on the objectives in more depth and to provide illustrations of analyses that can be used by educators to investigate the results from criterion-referenced information. The processes that were used to insure the representativeness of these objectives are described in Part II-Procedures, pages 14-15 and in Appendix D. The percentages of pupils mastering each of the objectives used for this assessment are given in Appendices E and F.

THE SELECTED OBJECTIVES

In this section each of the selected objectives is stated beneath the general mathematics category listings.

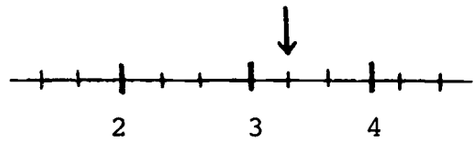
Explanation of the information provided with each objective

- The number to the left of each objective indicates where it can be located in the total list of objectives.
- An asterisk by the side of the number indicates that the objective was selected as being basic by the review groups.
- The portion of the total group of sixth-grade students that mastered the objective is given.
- The item used to measure mastery of each objective is given. (Items are copyrighted by CTB/ McGraw-Hill, Inc., and cannot be reproduced without permission of the publisher.)

Operations on the Number Line

1	Given a number line with units divided into fourths, the student will specify a given point on the line as a mixed number.

About 1/3 of the pupils mastered this objective. The students were asked to tell the mixed numbers that belonged at the point of the arrow.



Subtraction of Whole Numbers

13*	The student will be able to subtract a 3-digit whole number from a 3-digit whole number with regrouping.

70% of the sixth graders were able to do the following:

$$\begin{array}{r} 921 \\ -756 \\ \hline \end{array}$$

15*	The student will be able to subtract a 5-digit whole number from a 5-digit whole number with regrouping.

57% of the students were able to subtract

$$\begin{array}{r} 20{,}408 \\ -19{,}535 \\ \hline \end{array}$$

Multiplication of Whole Numbers

19*	The student will be able to multiply a 2-digit whole number by a 1-digit whole number.

Over 3/4 of the pupils were able to multiply

$$\begin{array}{r} 25 \\ \times\ 6 \\ \hline \end{array}$$

Addition of Positive Fractions

40*	The student will be able to rename a fraction by reducing the numerator and denominator to lowest terms.

14% of the sixth-grade students were able to do the following:

Reduce $\frac{48}{144}$ to lowest terms.

Division of Positive Fractions

65	The student will be able to divide a proper fraction by a mixed number.

1% of the pupils in the assessment could divide

$$7/8 \div 3\ 2/3 =$$

Subtraction of Decimal Numbers

78	The student will be able to subtract a decimal number with 2 decimal places from another decimal number with 2 decimal places with regrouping.

37% of the students were able to subtract

$$156.75 - 38.91 =$$

Multiplication of Decimal Numbers

83	The student will be able to multiply a 1-digit decimal fraction by a 1-digit decimal fraction.

Almost 1/3 of the sixth graders could multiply

$$\begin{array}{r} .3 \\ \times\ .8 \\ \hline \end{array}$$

Negative Integers

101	The student will be able to divide a 2-digit whole number by a negative integer.

40% of the students proved they could do the following:

Divide $20 \div -4 =$

Rounded Numbers (Estimation)

102	The student will be able to round off a 5-digit number to the nearest 10,000.

1/4 of the pupils were able to

Round 27,536 off to the nearest 10,000.

Commutative Property

107	Given an addition problem with two positive fractions as addends the student will be able to supply the missing factor in the commuted form of the problem.

32% of the students were able to find the number that made the following mathematical sentence true:

$$\frac{43}{165} + \frac{9}{13} = \frac{9}{13} + \underline{\quad\quad}$$

Inverse Relations

118	The student will be able to supply a missing positive fraction in a pair of unfinished mathematical sentences illustrating the inverse relationship between multiplication and division.

Slightly over 1/5 of the pupils could find the number that made both of the mathematical sentences true.

$$\frac{196}{50} \times \underline{\quad\quad} = 1 \qquad\qquad 1 \div \underline{\quad\quad} = \frac{196}{50}$$

Number Sequence

123	Given a sequence of positive fractions with like denominators and with numerators progressively decreasing by a constant value, the student will be able to supply a missing number from the sequence.

Over half of the sixth graders were able to supply the missing number from the following sequence:

$$\frac{17}{32}, \frac{15}{32}, \underline{\quad}, \frac{11}{32}, \frac{9}{32}, \frac{7}{32}$$

Number Theory

131	Given a set of whole numbers, the student will be able to select those which are composite.

Only 2% of the students in the assessment could choose the composite numbers from the following group of numbers:

1,2,3,4,5,6,7,8,9,10,11

Measurement

147*	The student will be able to add expressed amounts of money.

Slightly over 3/5 of the pupils could add

$$\begin{array}{r} \$25.28 \\ 2,05 \\ +46.75 \\ \hline \end{array}$$

148*	The student will be able to subtract expressed amounts of money.

62% of the students in the assessment proved they could do the following:

$$\begin{array}{rr} \text{Subtract:} & \$5.98 \\ & -3.72 \\ \hline \end{array}$$

Place Value

166* Given the expanded form of a 3-digit numeral, the student will write the numeral. (Expanded notation)

Over 4/5 of the pupils could write as one number

$(3 \times 100) + (5 \times 10) + 7 =$ _____

Non-metric Geometry

193 Given the scale of a map, the student will be able to compute the distance between any two points.

8% of the pupils could answer the following:

If one inch on a map represents 8 miles, then 13 inches on the same map represents how many miles?

Percent

202 The student will be able to convert a number greater than unity written as a fraction to percent form. (Percents greater than 100)

12% of the pupils showed that they could convert the following fraction to the correct percent form:

$\frac{14}{10}$ written as a percent would be ____%.

Sets

207 Given two finite sets, the student will specify the set that is the intersection of these sets. (Intersection)

45% of the sixth graders did the following:

List the elements contained in the set that is the intersection of sets E and F.

$E = \{5,7,10,14,15,27\}$ $F = \{7,8,9,13,15,22\}$

Reasoning

212	Given a word problem requiring one or more fundamental operations with small whole numbers for solution, the students will be able to solve the problem.

45% of the students correctly answered the following:

> If Bill is now 12 years old, and he is now twice as old as his sister, then three years from now his sister will be _____ years old.

Percentages of mastery of the selected objectives - The percentage of pupils mastering the selected mathematics objectives ranged from a high of 81% for the objective requiring the students to write the numeral for an expanded form of a three-digit numeral to a low of 2% for the objective asking the student to select the composite numbers from a set of whole numbers.

PUPIL PERFORMANCE BY POPULATION CATEGORIES

Figures 1 through 7 show pupil performance of various pupil populations on each of 21 objectives selected as representative of the 209 mathematics objectives. Comparable data for all 209 measured objectives appear in tabular form as Appendix F.

Looking at Figure 1, the percentage of pupils who mastered Objective #1 (identified on the bottom line of the figure) is seen, from the vertical scale, to be approximately 32% for males (M) and 27% for females (F). The distance between M and F represents the difference between the percentage of males and the percentage of females who mastered the objective.

Figure 1 shows, for each of the 21 objectives chosen as representative of all 209 objectives, the amount of difference between the percentage of achievers among the male and female pupils. On only two of the 21 objectives (#1 and #102) did a higher percentage of boys than girls achieve the objective. On none of the objectives is the difference between the sexes in their percentage of achievers greater than 10 percentage points.

FIGURE 1

PERCENT OF PUPILS MASTERING SAMPLE PMI OBJECTIVES BY SEX

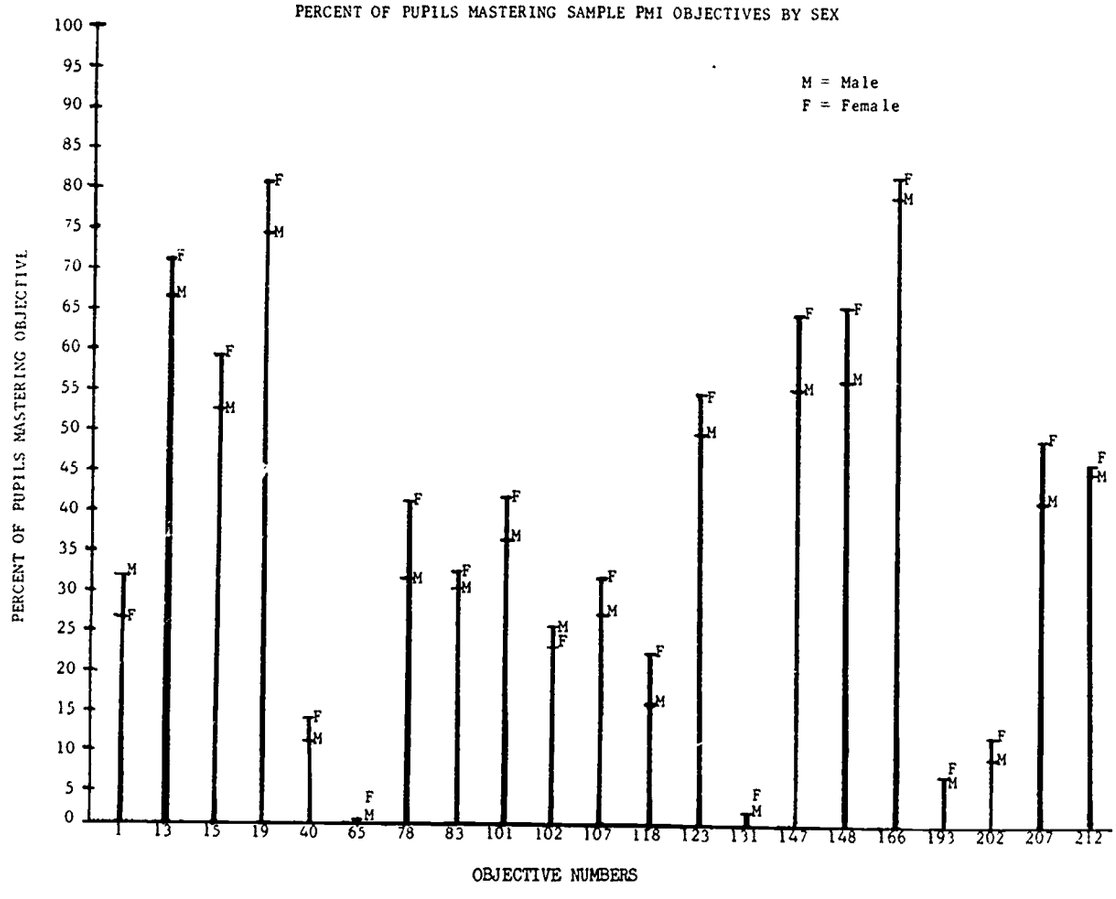


Figure 2 shows that on 13 of the 21 representative objectives, the percentage of achievers was at least 10 percentage points higher among pupils who were neither Black nor Mexican American. Of the remaining eight objectives, three were achieved by less than 10% of all pupils; on Objective #83 and #202, the percentage of achievers was almost as high among the Black and Mexican American pupils; on Objectives #19, #118, and #148, the percentage of achievers was almost as high among the Mexican American pupils as among pupils who were neither Black nor Mexican American.

FIGURE 2

PERCENT OF PUPILS MASTERING SAMPLE PMI OBJECTIVES BY ETHNICITY

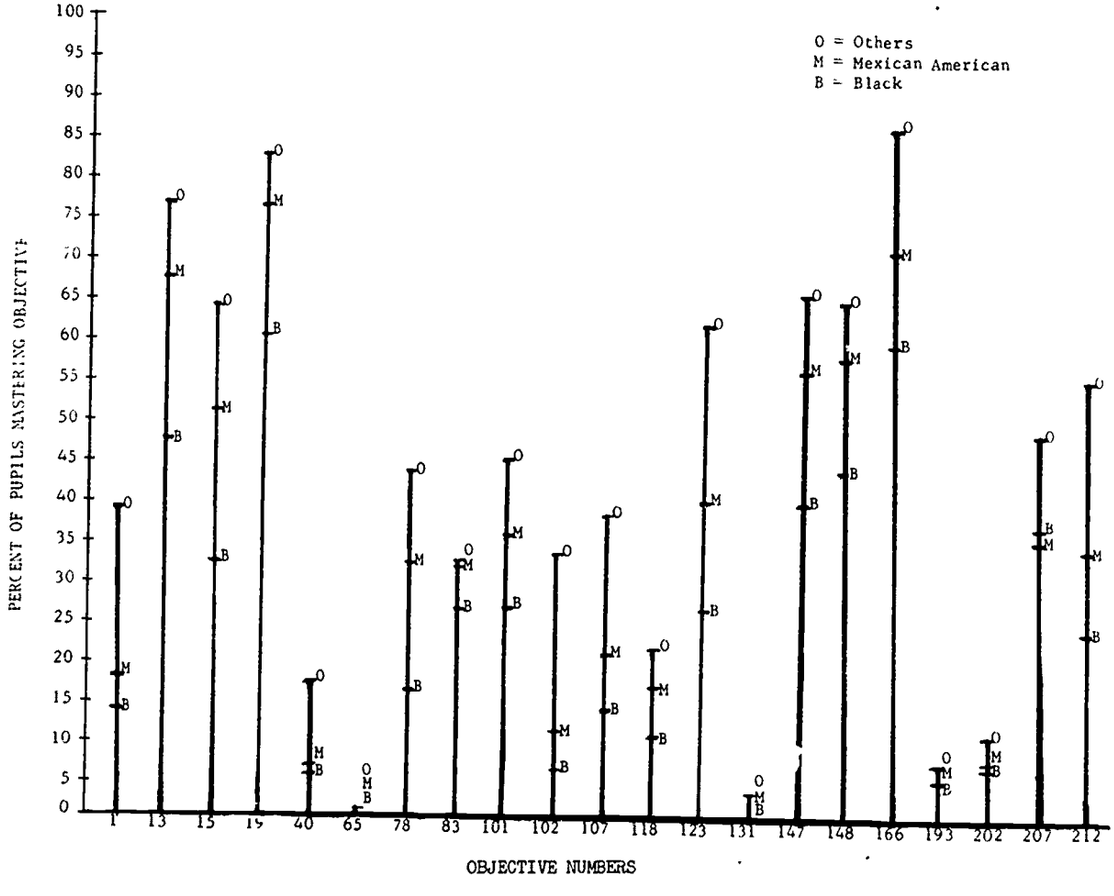


Figure 3 shows that on 10 of the 21 representative objectives, the pupils enrolled on campuses serving suburban communities had the highest percentage of achievers, those on campuses serving cities below 200,000 population had the second highest percentage of achievers, and those on campuses serving rural areas had the third highest percentage of achievers.

On 15 of the 21 objectives, the pupils on campuses serving cities of over 500,000 population or cities of 200,000 to 500,000 population had either the lowest or second lowest percentage of achievers. On Objective #207, however, pupils on campuses serving cities of over 500,000 population had the highest percentage of achievers.

FIGURE 3

PERCENT OF PUPILS MASTERING SAMPLE PMI OBJECTIVES BY SIZE OF COMMUNITY

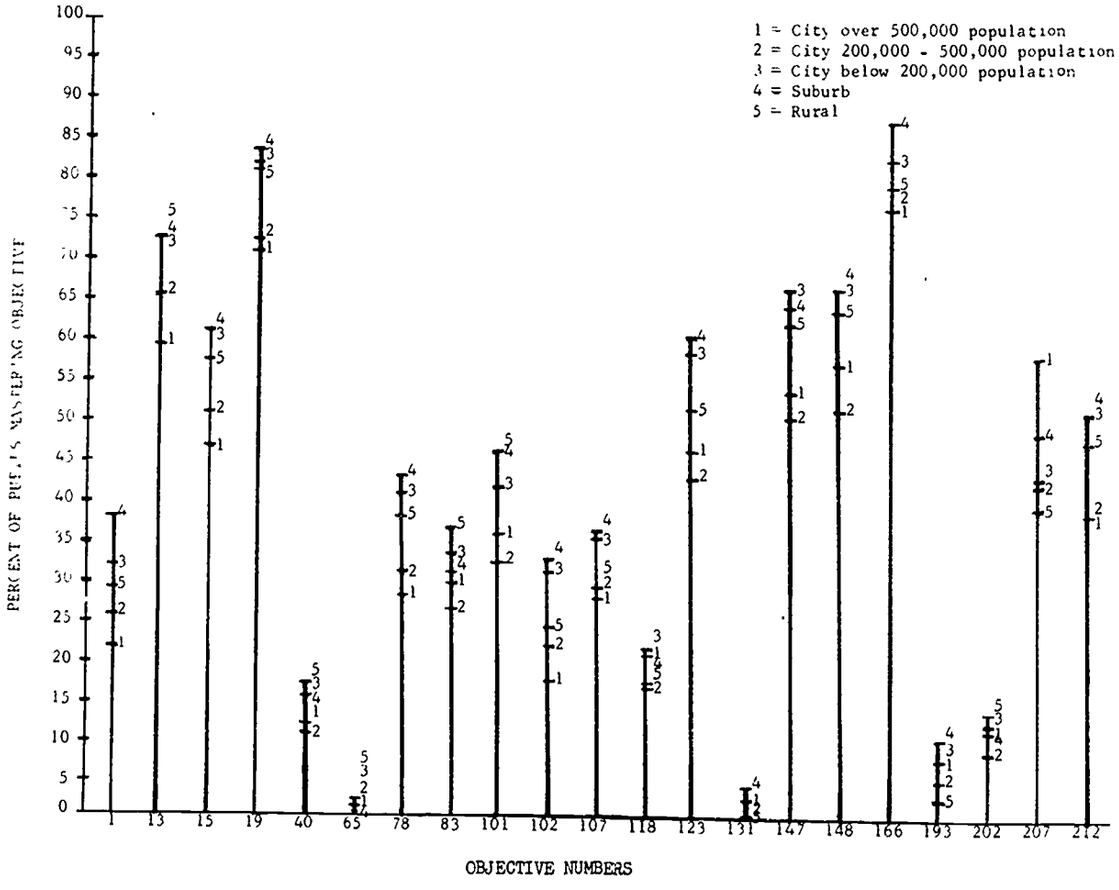


Figure 4 shows that for only one (Objective #207) of the 21 objectives is the difference in the percentage of achievers among those enrolled on Non-Title I campuses and among those enrolled on Title I campuses greater than seven percentage points.

FIGURE 4

PERCENT OF PUPILS MASTERING SAMPLE PMI OBJECTIVES BY FUNDING SOURCE

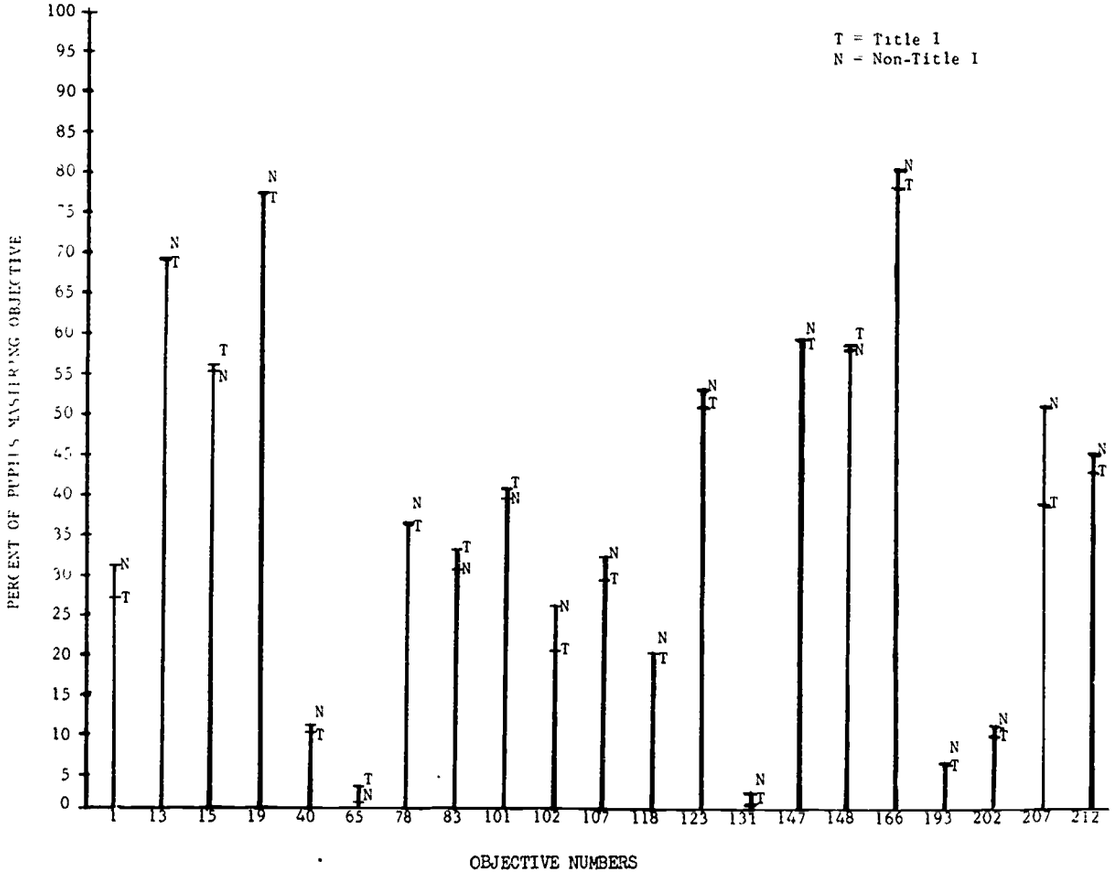


Figure 5 shows that for all except four of 21 representative objectives, pupils from homes where the educational emphasis is high had a percentage of achievers at least 10 percentage points greater than that of pupils from homes where the educational emphasis was low; of the four exceptions, only Objective #83 was achieved by over 10 percent of all pupils. Achievement on Objectives #1, #123, and #212 is seen to be highly sensitive to the Educational Emphasis Index.

FIGURE 5

PERCENT OF PUPILS MASTERING SAMPLE PMI OBJECTIVES BY EDUCATIONAL EMPHASIS INDEX

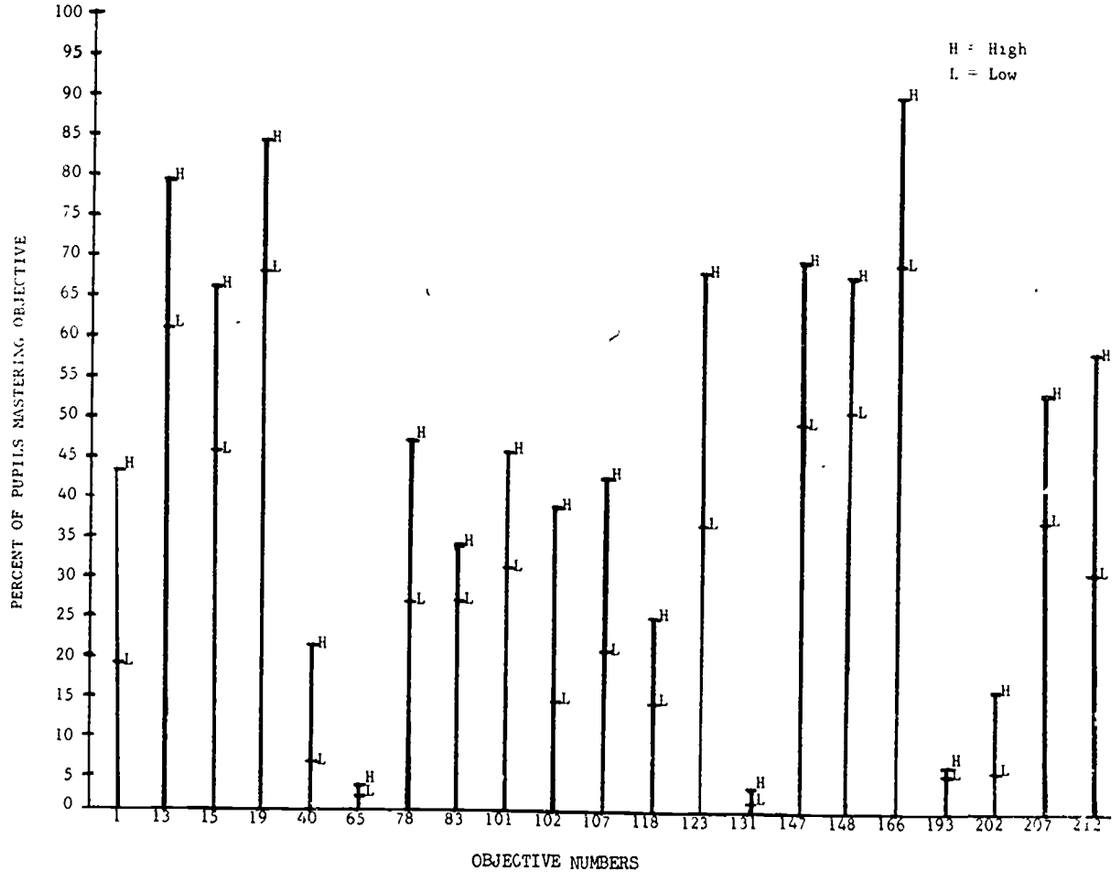


Figure 6 shows that on 17 of the 21 representative objectives, pupils who checked "Yes" in response to the question "Are you good in arithmetic?" had a percentage of achievers at least 10 points higher than pupils who checked "No." Of the remaining four objectives, three were achieved by less than 10% of all pupils; Objective #83 stands out as an objective on which pupils who did not perceive themselves as being good in arithmetic had almost as high a percentage of achievers as those who perceived themselves as being good in arithmetic.

FIGURE 6

PERCENT OF PUPILS MASTERING SAMPLE PMI OBJECTIVES BY SELF-PERCEPTION IN ARITHMETIC

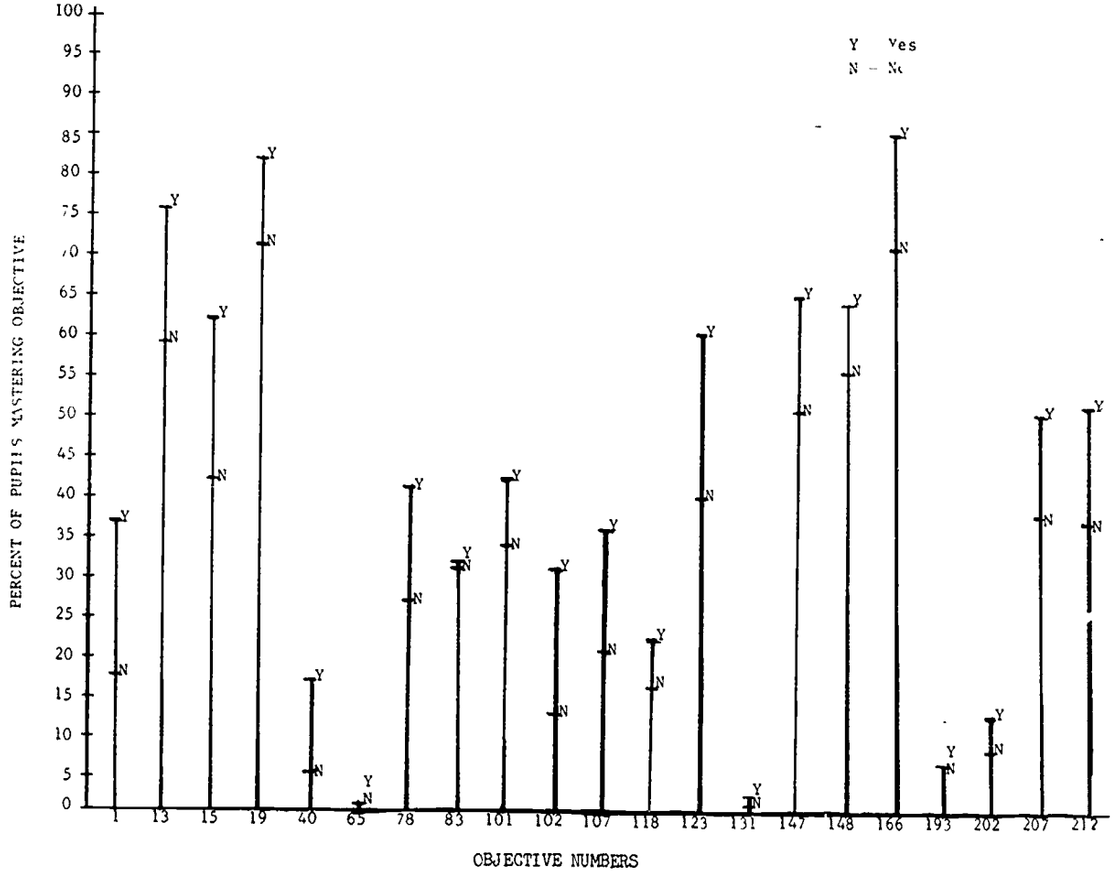
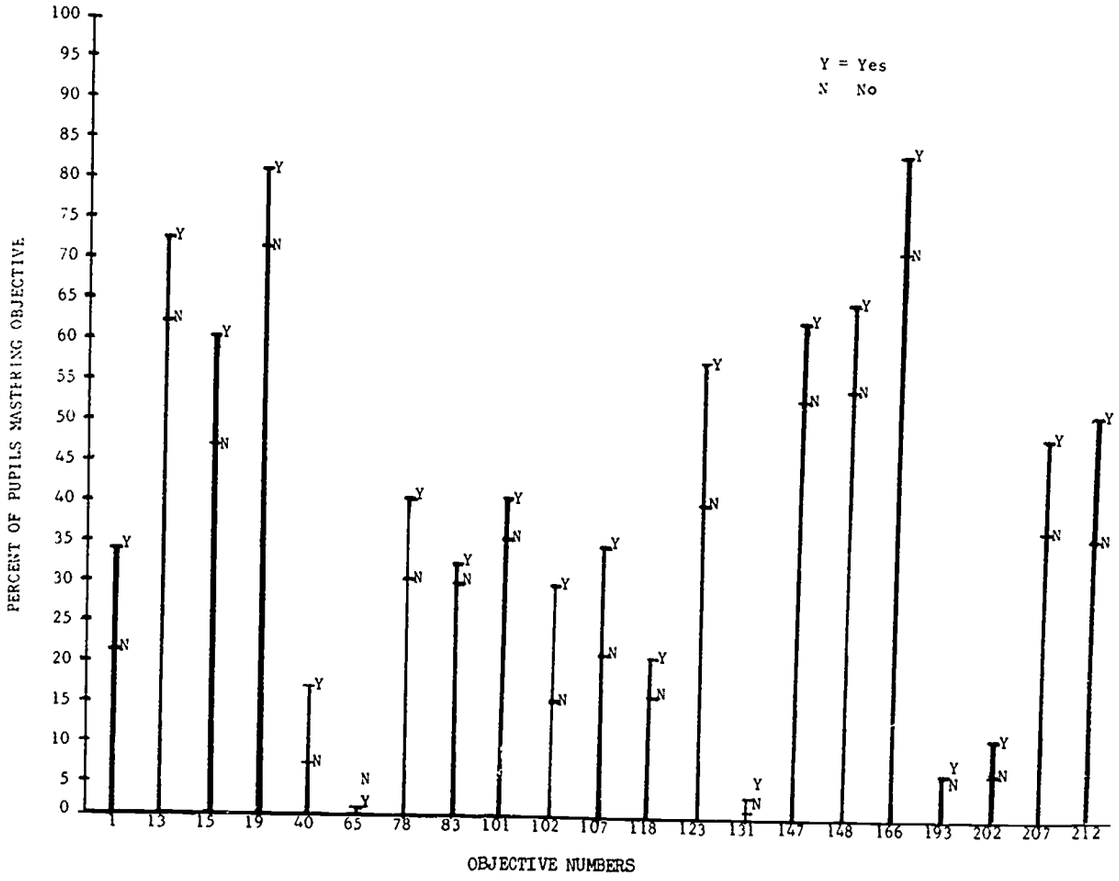


Figure 7 shows that pupils who checked "Yes" in response to the question "Are you good in reading?" had a higher percentage of achievers than pupils who checked "No." On 14 of the 21 objectives, the difference was greater than 10 percentage points.

FIGURE 7

PERCENT OF PUPILS MASTERING SAMPLE PMI OBJECTIVES BY SELF-PERCEPTION IN READING



ADDITIONAL ANALYSES

Figure 1 through Figure 7 each focused upon one characteristic (such as ethnicity of the pupils or type of community served by the pupils' campus) and presented data for all 21 representative objectives. Figure 8 through Figure 10 reverse the focus; each figure presents, for a single objective, data for all seven pupil/campus characteristics.

Figure 8, 9, and 10 show for Objectives #123, #166, and #107, respectively, the amount by which the performance of pupils of several subgroups differs from the performance level of all Texas pupils. The largest deviations can be seen to occur on the basis of ethnicity; educational emphasis also is seen to have a strong relationship to pupil performance. Deviations on the basis of sex or on the basis of whether the campus on which the pupils are enrolled participates in Title I, ESEA, are seen to be slight.

The volume of this report would be expanded unduly if a figure were provided for each of the 21 representative objectives. The three whose data are presented as typical of the predominant patterns include one near the 50% level of achievement, one near the 80% level, and one near the 30% level. Readers can use the data of Appendix F to construct similar figures for any objectives of particular interest to them. An education service center could use the data it has received to construct such charts for its region. A school might want to construct charts for those PMI objectives which are most related to their mathematics program; however, since schools were not selected so as to be representative of their school district, districts should not sum the data from their schools that participated in this assessment study to construct district figures.

FIGURE 8
DEVIATIONS OF SUBGROUPS FROM PERFORMANCE LEVEL OF ALL TEXAS PUPILS
ON OBJECTIVE #123, NUMBER SEQUENCES (LINEAR FUNCTIONS)

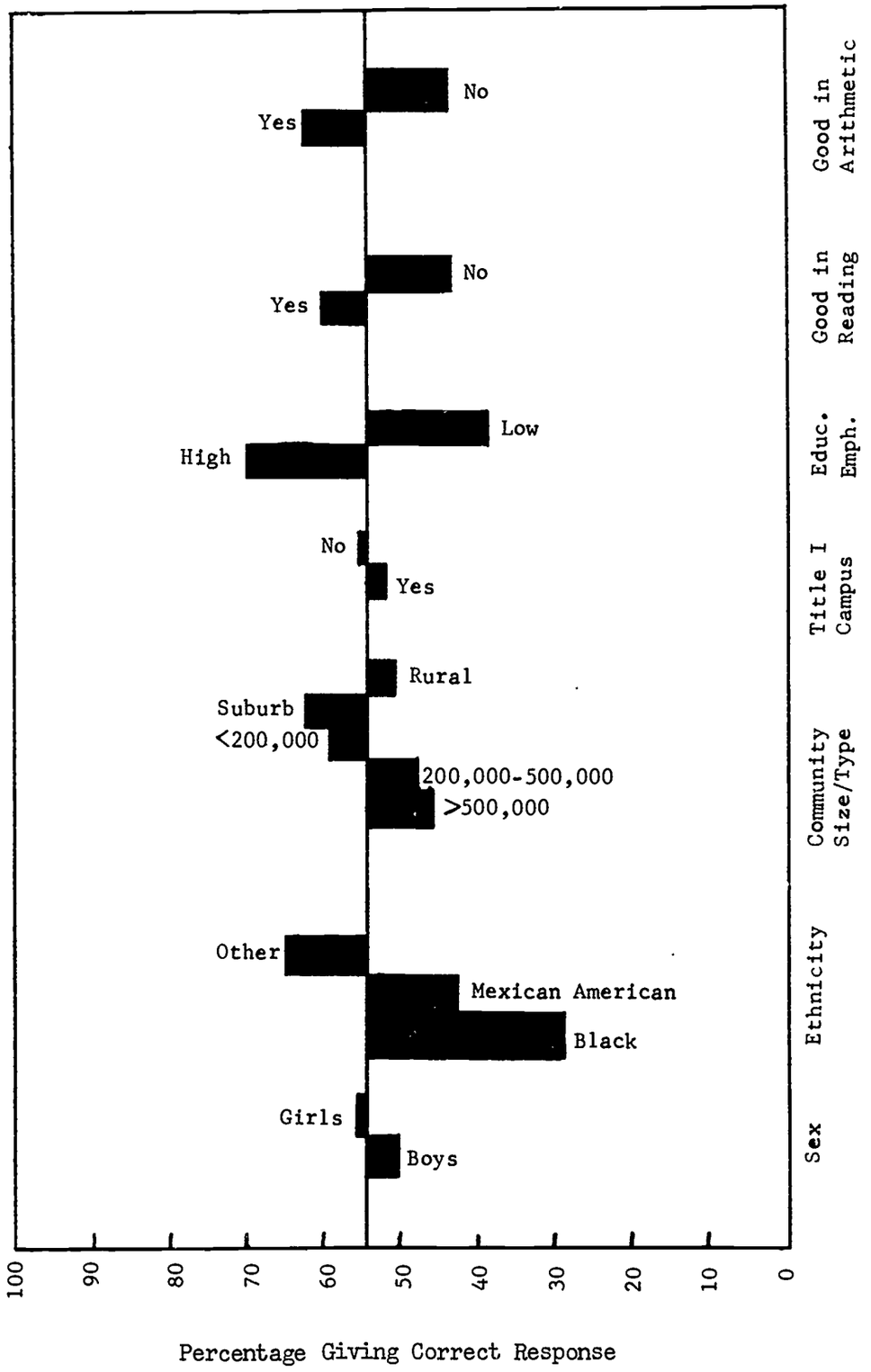


FIGURE 9
DEVIATIONS OF SUBGROUPS FROM PERFORMANCE LEVEL OF ALL TEXAS PUPILS
ON OBJECTIVE #166, PLACE VALUES

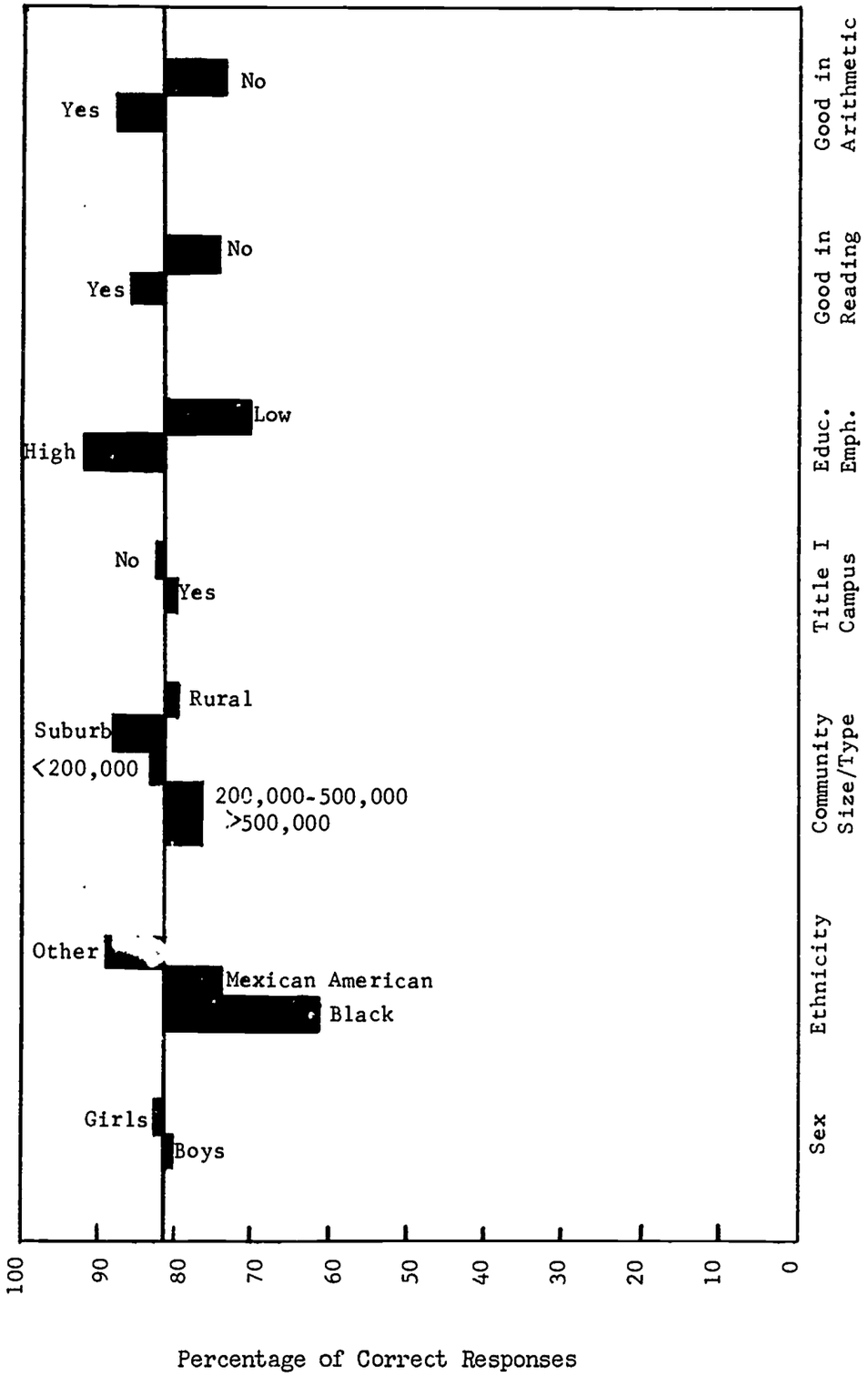
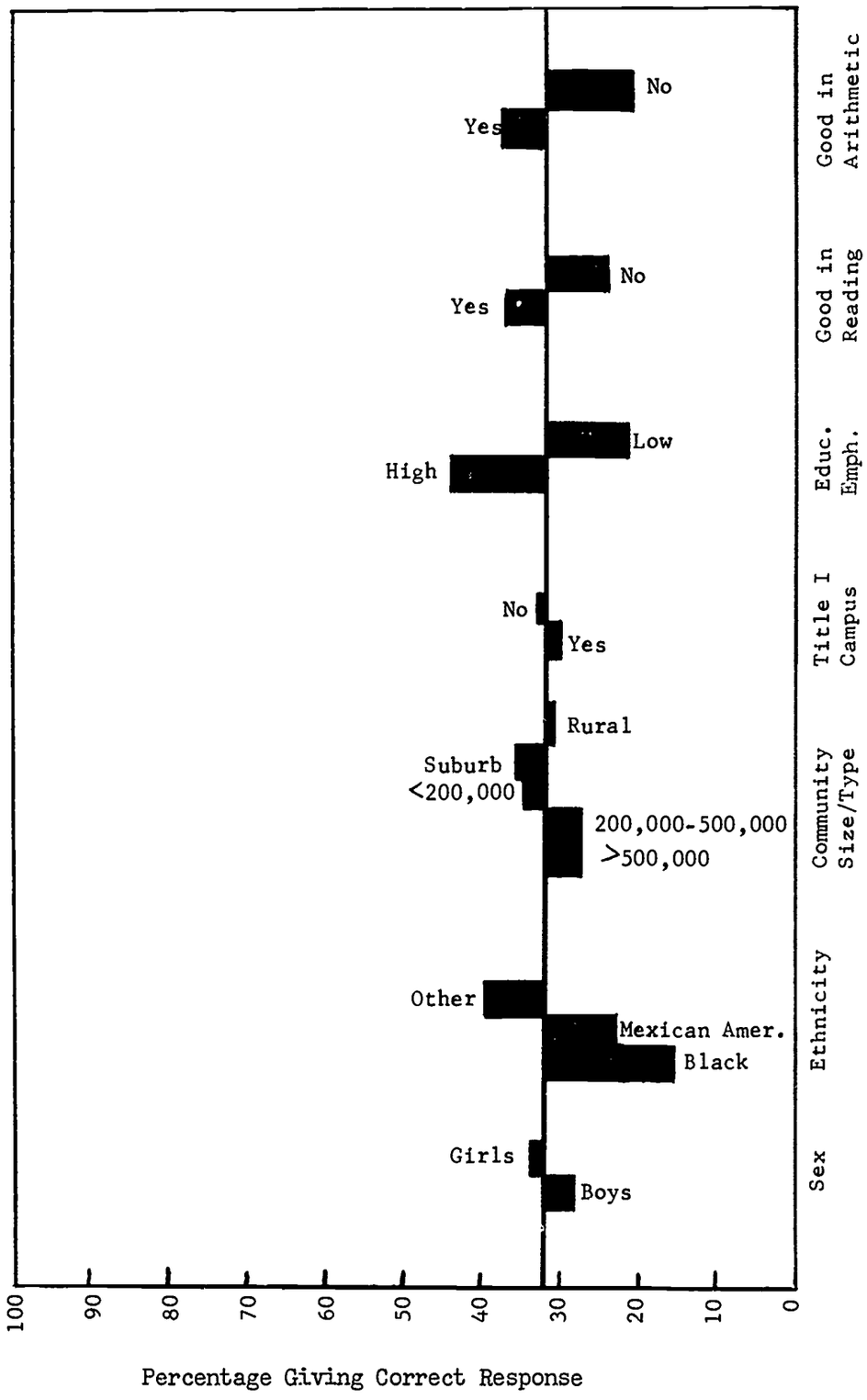


FIGURE 10
DEVIATIONS OF SUBGROUPS FROM PERFORMANCE LEVEL OF ALL
TEXAS PUPILS ON OBJECTIVE #107, COMMUTATIVE PROPERTY



V. SUMMARY OF FINDINGS

The PMI data were collected from a representative (10%) sample of Texas sixth-grade pupils according to their sex distribution, ethnic groups, sizes of communities in which their schools were located, and funding source (Title I/ Non-Title I schools).

The project was so designed that the education service centers and participating schools worked cooperatively in providing accurate information by making sure that the pupils had every chance to answer the questions, and by checking the pupils' responses on the PMI answer sheets. The length of the instructions necessary to take or administer the PMI was kept to a minimum so that the pupils could spend their time on taking the test. The test administrators were encouraged to help the pupils in whatever way possible (with the exception of answering the questions or working the problems for them). No attempt was made to determine the exact conditions under which these tests were administered; however, it could be assumed that the testing situations varied almost as much as the performances of the pupils (e.g., some of the school personnel indicated that they tested all of the sixth graders at the same time in the auditorium within a two-day period while others had their pupils work on the test over a two-week period as a part of their regular classwork). No attempt was made to relate the kinds of testing situations to the performances of the pupils on the PMI; however, very few comments on the teacher's evaluation survey seemed to indicate that this was a problem.

An advantage of the PMI is that it is a "power-test," not a "time-test." It was designed specifically to measure the performances of every pupil no matter how much or how little time it took. Therefore, the PMI data should give a fairly accurate indication of how the pupils were able to perform with regard to the 209 measured objectives covered in the state-adopted textbooks for mathematics. Whether or not these pupils had been taught or had learned to achieve objectives other than those in the PMI is unknown and an area for further investigation.

Considerable effort was made to eliminate any cultural bias in the wording of test items in the PMI. The purpose of the

PMI was not to discriminate against any particular pupil population but to determine if any of the pupils performed differently on the PMI, regardless of their reference groups. Unfortunately, time did not permit a tryout of the PMI objectives on a sample of different pupil populations. The extent to which the PMI data is invalid will depend upon the demonstration of bias in the PMI test items and/or objectives derived from the state-adopted textbooks for mathematics at the sixth-grade level.

Criteria - Setting universal standards for pupil performances in mathematics is difficult if not undesirable. The criteria for "acceptable" performance can, of course, be established in any number of ways: comparing the performances of pupils with other pupils, developing absolute standards of excellence, setting minimum levels for achievement in society, having the individual pupil set his own levels of performance, and so on. In this case, a select group of educational experts and teachers was asked to rate the PMI objectives as to whether they thought they were "basic" or "desirable" for the pupils functioning in society. Whether the performances of the pupils meet these expectations is apparent throughout this report; whether these are the acceptable levels of pupil performances is still an open question and should condition the drawing of hard-and-fast conclusions.

Utility - The use, in the modification of instructional programs, of conclusions regarding pupils' achievement of the objectives should occur only after consideration of such matters as

- the degree to which the pupils have been exposed to the objectives
- the level of difficulty of the test items, and
- the relevance of the test item content to the pupils' cultural experiences.

Related studies - The Agency is conducting two studies directed toward determining the relationships between pupil learning and school based factors. The Department of Special Education and Special Schools has undertaken a project entitled Programmed Reentry Into Mainstream Education (PRIME). Project PRIME focuses upon the relationship between learning, on the one hand,

and such variables as children's personality characteristics, classroom social organization and climate, teacher behaviors and attitudes, peer relations, and home environment, on the other. The Division of Accreditation is undertaking a study of the relationships between learning and a host of variables such as curricular offerings, teacher qualifications, school expenditures, ethnic composition of the campus pupil population and staff, and community characteristics.

GENERAL FINDINGS

The percentage of pupils achieving the PMI objectives ranged widely-from zero in the case of four objectives (#90, #95, #96, and #203) to 94% for Objective #204. On only 105 of the objectives did the percentage of achievers fall below 30%. At least half the pupils achieved 47 of the 209 objectives that were measured.

Pupils' performances on the PMI objectives were analyzed to determine the relative standing of

- boys and girls
- Black, Mexican American, and other pupils
- pupils whose schools were and were not participating in ESEA, Title I
- pupils whose schools were located in communities of various sizes and types
- pupils whose educational environment at home was high and low
- pupils who did and who did not perceive themselves as good in reading
- pupils who did and who did not perceive themselves as good in arithmetic.

For each of the above characteristics, the percentages of pupils achieving each of the 209 PMI objectives are presented in Appendix F, and a summary chart of the total performances of all the sixth graders is given in Appendix G.

Sex - The percentage of girls achieving the objective exceeded the percentage of achieving boys by at least five percentage points on

- 86 objectives
- 18 of the 21 objectives concerned with multiplication and division of whole numbers
- 10 of the 11 objectives concerned with the addition and subtraction of decimal fractions
- all 12 of the objectives concerned with the commutative property, associative property, distributive property, identity element, and inverse relation.

On only six objectives did the percentage of achievers among the boys exceed the percentage of achievers among the girls by five or more percentage points; four of these were in the area of measurement.

Ethnicity - On 151 of the 153 objectives achieved by at least 10% of the pupils, those who were neither Black nor Mexican American had a higher percentage achieving the objective than either Blacks or Mexican Americans; the exceptions were Objectives #100 and #194. On only one (#207) of these 153 objectives did the Blacks have a higher percentage of achievers than the Mexican Americans.

On 78 of the 153 objectives achieved by at least 10% of all pupils the percentage of Black pupils achieving the objectives was less than half as large as the percentage achieving the objective among pupils who were neither Black nor Mexican American.

On 29 of the 153 objectives achieved by at least 10% of all pupils, neither Black nor Mexican American pupils had half as large a percentage of achievers as pupils who were neither Black or Mexican American. Ten of these 29 objectives are concerned with the addition, subtraction, or multiplication of positive fractions; four with rounded numbers (estimation); three with number sequences (linear functions); six with measurement; three with numeration systems; two with operations on the number line; and one with the multiplication of whole numbers.

On nine of the 153 objectives achieved by at least 10% of all pupils the differences in performance among the three ethnic categories did not spread more than 10 percentage points; these were Objectives #56, #83, #86, #100, #174, #183, #192, #194, and #202.

Pupils on Title I Campuses - On only nine of the objectives did the pupils from campuses not participating in Title I, ESEA, have a percentage of achievers more than five points larger than that of the pupils from campuses participating in Title I; on only one objective, #207, was the difference more than eight percentage points.

On none of the objectives did the pupils from Title I campuses have a percentage of achievers more than three points larger than that of the pupils from campuses not participating in Title I.

Size and type of community - For each of the objectives, the percentage of pupils achieving the objectives was tabulated for pupils on campuses serving

- suburban communities
- cities of less than 200,000 population
- rural areas
- cities of 200,000 to 500,000 population
- cities of over 500,000 population.

Comparison of the percentage of achievers on each of the 209 measured objectives among the pupils on campuses serving each of the five types of communities disclosed a fairly consistent pattern:

1. The pupils on campuses serving suburban communities, on all except 20 objectives, either had or came within three percentage points of having the highest percentage of achievers.

2. The pupils on campuses serving cities of less than 200,000 population, on all except two objectives, either had or came within three percentage points of having the second highest percentage of achievers.

3. The pupils on campuses serving rural areas, on all except 13 objectives, either had or came within three percentage points of having the third highest percentage of achievers.

4. The pupils on campuses serving cities of 200,000 to 500,000 population, on all except 11 objectives, either had or came within three percentage points of having the fourth highest percentage of achievers.

5. The pupils on campuses serving cities of over 500,000 population, on all except 17 objectives, either had or came within three percentage points of having the lowest percentage of achievers.

Departures from the predominant pattern indicate that campuses of various sizes and types differ in the emphasis which they place on certain objectives:

1. On Objective #207, the pupils on campuses serving cities over 500,000 population had the highest percentage of achievers and pupils on campuses serving rural areas had the lowest percentage of achievers.

2. On Objective #84 and Objective #87, the pupils on campuses serving suburban communities had the lowest percentage of achievers.

3. On Objectives #111, #113, #115, #122, #146, #148, #154, #168, #185, and #198, the usual ranking obtained by campuses serving cities of 200,000 to 500,000 population was reversed with that usually obtained by campuses serving cities of more than 500,000 population.

4. On Objective #163 and Objective #207 the pupils on campuses serving rural areas had the lowest percentage of achievers.

5. On Objectives #40, #41, #44, #150, #151, #154, #161, and #162, the pupils on campuses serving rural areas had the highest percentage of achievers.

6. On Objective #171, the pupils on campuses serving cities of less than 200,000 population had the highest percentage of achievers and pupils on campuses serving cities of more than 500,000 population had the second highest percentage of achievers.

7. On Objective #169, pupils on campuses serving cities of more than 500,000 population had the second highest percentage of achievers and pupils on campuses serving suburban communities had the fourth highest percentage of achievers.

8. On Objectives #163, #169, and #171, the pupils on campuses serving cities of more than 500,000 population had the second highest percentage of achievers.

9. On Objective #170, pupils on campuses serving cities of more than 500,000 population had the third highest percentage of achievers and the pupils on suburban campuses had the fourth highest percentage of achievers.

10. On Objectives #33, #35, #36, #40, #41, #44, #89, #150, #151, #154, #176, and #185, the pupils on campuses serving suburban communities had the third highest percentage of achievers.

Educational emphasis in the home - For each of the 209 objectives, the percentage of pupils achieving the objective was tabulated for pupils from homes where educational emphasis was extremely high or extremely low (see page 12 for derivation of the Educational Emphasis Index).

On all except seven of the 153 objectives achieved by at least 10% of the pupils, the percentage of achievers among pupils from homes having a high educational emphasis was either at least 10 percentage points greater than among pupils from homes having a low educational emphasis or was at least double the percentage of achievers among pupils from homes having a low educational emphasis. The seven exceptions were

Objective #86 (High Emphasis 14%, Low Emphasis 9%)
Objective #100 (High Emphasis 12%, Low Emphasis 14%)

Objective #183 (High Emphasis 18%, Low Emphasis 12%)
Objective #184 (High Emphasis 21%, Low Emphasis 13%)
Objective #192 (High Emphasis 18%, Low Emphasis 11%)
Objective #194 (High Emphasis 10%, Low Emphasis 11%)
Objective #204 (High Emphasis 96%, Low Emphasis 91%)

Self-perception in arithmetic - Pupils who felt they were good in arithmetic had a higher percentage of achievers, on all except five of the 209 objectives, than pupils who did not feel they were good in arithmetic. Three of the exceptions were objectives achieved by less than 2% of the pupils; the others were Objective #194 (which was achieved by 11% of each group) and Objective #100 (which was achieved by 13% of each group).

On 141 of the 153 objectives achieved by at least 10% of the pupils, the percentage of achievers among pupils who felt they were good in arithmetic was either at least seven percentage points greater than among pupils who did not feel they were good in arithmetic, or was at least double the percentage of ahcievers among pupils who did not feel they were good in arithmetic. On 24 of the objectives the difference was 20 percentage points or greater.

Self-perception in reading - Pupils who felt they were good in reading had a higher percentage of achievers, on all except 10 of the 209 objectives, than pupils who did not feel they were good in reading; all of the 10 exceptions were objectives achieved by less than 2% of the pupils.

On 137 of the 153 objectives achieved by at least 10% of the pupils, the percentage of achievers among pupils who felt they were good in reading was at least seven percentage points greater than among pupils who did not feel they were good in reading.

Recapitulation - Approximately one quarter of the 209 objectives were achieved by at least half the pupils and another quarter by less than 10% of the pupils.

The following statements apply for the 153 objectives achieved by at least 10% of the pupils:

1. On a little over half of these objectives the girls had a substantially higher (i.e., at least four points) percentage of achievers than the boys.

2. On over 95% of these objectives

   - Others (primarily Anglos) had a higher percentage of achievers than Mexican Americans, and

   - Mexican Americans had a higher percentage of achievers than Blacks.

3. The percentage of achievers among the Others was

   - on half of these objectives, double the percentage of achievers among the Blacks

   - on a fifth of these objectives, double the percentage of achievers among the Mexican Americans.

4. On about 90% of these objectives the percentage of achievers was substantially higher among pupils who responded affirmatively to the questions: "Do you feel you are good in arithmetic?" or "Do you feel you are good in reading?"

The superior performance of the girls over the boys is strongest in three areas:

- multiplication and division of whole numbers

- addition and subtraction of decimal fractions, and

- properties of the number system.

On only nine of the objectives did the pupils on campuses not participating in Title I, ESEA, obtain substantially higher (five or more points) percentages of achievement than pupils on campuses which are participating in Title I.

On most of the objectives the pupils on campuses serving

- suburban communities had the highest percentage of achievers

- cities of less than 200,000 population had the second highest percentage of achievers

- rural areas had the third highest percentage of achievers

- cities of 200,000 to 500,000 population had the fourth highest percentage of achievers, and

- cities of over 500,000 had the lowest percentage of achievers.

Substantial departures from the above pattern of relative performance among pupils on campuses serving communities of various sizes and types were observed in the cases of 38 objectives.

VI. USE OF ASSESSMENT INFORMATION

Teachers whose pupils were tested have received reports of the performance on each of the objectives by each individual pupil; in addition, the teachers and principals have received summary reports by classroom and by campus. The sample was not designed to provide superintendents with a representation of performance by school districts. The campuses selected to contribute to the representation of each education service center region and, in total, the State of Texas, were not necessarily representative of the school district from which they were drawn.

The information in this statewide report is appropriate for use by curriculum directors, mathematics supervisors, and other district level personnel having responsibility for planning, developing, and implementing programs for students.

MAKING USE OF THE ASSESSMENT INFORMATION

Review of the objectives - The objectives for the Prescriptive Mathematics Inventory-Level B which was used as the assessment instrument for this study are based on mathematics skills and concepts taught in most classrooms through the sixth-grade level. They were derived from an analysis of the major series of textbooks that are used in schools, including those on the state-adoption list in Texas.

A beginning point in making use of the results is to study the PMI objectives and note the ones that are relevant to the district's mathematics program. If the school district's mathematics program objectives have not been specified, a good reference is the set of objectives found in curriculum guides or in the charts available with the mathematics textbook series in use in the district. In all probability there will not be a complete congruence between the PMI's objectives and the school's objectives. Also, in reviewing the objectives, note those that have been designated as "basic" by statewide evaluation groups.

If the district does not have program objectives for the mathematics curriculum, the objectives used with the PMI

could be of assistance in developing these. The objectives that are developed by the district can serve to point directions for instruction and can communicate progress in student performances. The incorporation of "basic" objectives into the district's overall program objectives could provide a start for the development of some type of minimum level for students to reach to operate as consumers in society.

Determining pupil performances - The results from this statewide mathematics study, because of sampling procedures used, would not present a true picture of pupil performance for each school district that participated in the mathematics assessment. The state sample purposely includes a certain percentage of different student populations that is representative of Texas. However, with the use of the objectives for the mathematics program, information similar to that in the assessment study can be developed by school districts. Several alternatives can be used.

Some concepts about the status of students can be derived from studying the reports provided for schools through this assessment. Direct statements about district level of performances cannot be made but some general perceptions about students in relation to the objectives can be made. If the objectives that are included in the district's mathematics program have been noted, the educators at the district level can later investigate any discrepancies between what might be expected as the performance and the actual performance.

Another alternative for determining pupil performance in relation to learner objectives for the mathematics program at the district level would be to administer a criterion-referenced test instrument as a part of the school district's testing program. However, careful preliminary planning must be done if assessment information such as that gained in the statewide study is to be gathered. For instance, a grade level for assessment has to be chosen. Plans have to be made for collecting demographic information about the student population groups and for relating this information to student performances. If the assessment is going to be based on a sample of students, then the sampling plan must be developed. Because of the type of information that is required for a district-wide assessment, it is probable that computer services will be necessary. If the alternative of conducting a district

assessment similar to the statewide mathematics assessment is chosen, a review of the procedures used for the 1971 Texas Assessment of Reading and Mathematics would be helpful.

Summarizing the results - The information about student performances on the statewide assessment of mathematics and the emphasis in this section on transferring some of the concepts from this assessment for use in school districts is based on the use of criterion-referenced instruments for assessment.

The results of criterion-referenced instruments have to be treated differently from those received from standardized tests that most school personnel are accustomed to using. This difference is due primarily to the psychometric procedures used in developing the two different types of instruments. Criterion-referenced tests are intended for determining the relationship between measurable objectives and student performances relative to mastery of these objectives, while standardized (norm-referenced) types of tests are intended to find out about the abilities of students by comparing them with other students. Because of the importance of the objectives in criterion-referenced testing, group reports of results are stated by giving the percentage of pupils who mastered each objective. These results cannot be summed into a single performance score as in the case of norm-referenced test results.

Application of assessment results - As was mentioned in the section on determining pupil performances, a school district will be interested in the relationship between expectations for performance and the actual performances of students. Some considerations should be taken into account in setting the expectation levels. These are the degree of difficulty of the performance expressed in the objective, the amount of previous instruction that the students have had in the subject matter covered by the objective, and the grade level or educational level of the students. A review of student performances should include notations of any discrepancies. For example, school personnel may have set an expectancy level that 50% of the district's students upon entering the sixth grade had mastered the objective of being able to add like fractions with regrouping. If the sixth graders' performance on the assessment revealed that 30% of these students mastered this objective, then the 20% discrepancy on this objective would be noted for investigation. These discrepancies can then be organized into statements that express the needs of learners in the mathematics program.

Before an investigation of causative factors is initiated the assessment information should be validated, particularly if it was derived from one test instrument that was administered once during the school year. One method of validation would be for teachers to readminister items related to objectives that the assessment indicated students were having difficulty in mastering. After validations, causative factors for the remaining discrepancies might be investigated from several points of view. Several approaches might be taken.

A study could be made of the instructional materials used by the schools in the district. Perhaps the instructional materials in use, such as the basic text, do not emphasize the skills and concepts covered in some of the objectives. If certain student population groups are showing discrepancies on a large number of mathematics objectives, the entire range of instructional materials might be studied to determine the problem with current materials and to identify different and alternative instructional materials that might hold more relevance for pupils from various environmental backgrounds.

The instructional techniques used in the classroom could be investigated if gross discrepancies have been revealed. If the predominant instructional pattern used in the school is group oriented, the assessment information might indicate that many of the students have not had sufficient time and explanation to master the ideas stated by the objectives. Organization for instruction might be changed because of the information provided by the assessment.

Many more investigations can be initiated from an analysis of assessment data that have not been covered in this report. For instance, such possible causation factors as teacher attitudes, parental and community attitudes, and student motivational factors might be studied.

Making use of all the information from an assessment study is like opening "Pandora's box." Studying the data from differing frames of reference can produce a variety of investigations and a variety of interpretations. For a school district with

limited time and resources, the statements of student needs that are derived from the assessment information will have to be prioritized and plans will have to be developed for a series of phases directed towards alleviation of the needs.

A thorough report on the usefulness of the information from the 1971 study and adaptation of assessment concepts by a school district would be quite lengthy. However, school districts can contact the Texas Education Agency or their regional education service center for more information about utilization of the results of the 1971 Texas Assessment of Mathematics, or needs assessment in general.

VII. EVALUATION

An essential part of the assessment project was its evaluation phase. Evaluative information was requested from teachers and other school personnel to determine

- the degree to which school personnel are familiar with the concepts of criterion-referenced tests
- the teachers' perceptions about the usefulness of criterion-referenced information in the classroom, and
- the degree to which the present system of communication about assessment projects is providing information for the classroom teacher.

An independent consultant assisted the Texas Education Agency in the development of four separate instruments for evaluation purposes. These were:

1. Survey Form for School Contact Persons - These were designed for use by the assessment contact persons in the education service centers to determine the extent to which school personnel were knowledgeable about and used criterion-referenced tests.

2. Survey of Teacher Opinion I - These were designed to record the initial reactions of sixth-grade mathematics teachers to the assessment procedures and instruments used (after they had been administered but before the results had been returned to the schools).

3. Evaluation Form-Post-Test Workshop - Workshops were held in each of the education service centers to review the test results and to discuss how the information could be used in classroom instruction. This evaluation form was used to find out how well school personnel thought the objectives for the post-test workshops were met.

4. Survey of Teacher Opinion II - These questionnaires were designed for sixth-grade mathematics teachers to express their reactions to the total assessment effort after most of them had the opportunity to study and use the results.

A brief summary of the responses to each individual evaluation instrument is presented in Appendix H. The following conclusions can be drawn from these evaluation summaries:

1. Criterion-referenced testing was a new experience for over 90% of the school personnel.

2. The teachers surveyed agreed that the testing was (a) based on measurable objectives, (b) primarily for diagnostic or planning purposes, and (c) more useful as a diagnostic tool than norm-referenced tests for pupil appraisal.

3. Since school personnel agreed with the concepts of criterion-referenced testing, but were not sure that they could explain the principles involved to another teacher, perhaps they have not had enough experience with this type of testing to really understand the implications.

4. The evaluative questionnaires used to collect information showed that the respondents were very positive in their opinions, and that the results from criterion-referenced testing would be useful for planning classroom instruction and for tailoring programs to the continuous progress of pupils in the participants' schools.

5. An analysis of the comments from teachers who responded "No" to the inquiry about the usefulness of results in the classroom on the "Survey of Teacher Opinion II", reflected concern for the following:

   . The lateness in arrival of the results did not give enough time to make full use of the information about pupils during the remainder of this school year. (The results were late because of technical problems encountered by the test contractor in scoring the results.)

- The subject-matter covered in class was not covered on the tests or some of the items on the tests were not to be covered in the teachers' classrooms.

- The test results were not applicable to the teachers' classroom situations, for instance the classes were too large to permit individualization of instruction.

- The tests were too difficult for some of the pupils.

- Not enough textbook references were given with the test references.

- The validity of the concepts upon which the criterion-referenced tests were developed was not challenged.

6. Affirmative comments about the usefulness of the criterion-referenced results in the classroom emphasized the fact that the information identified pupil weaknesses in skills, identified areas of the curriculum needing study, and identified special pupil abilities.

7. A majority of the teachers found the test results useful especially if they or their school had interest in some system of continuous progress of pupils and if they understood the diagnostic and planning concepts upon which the criterion-referenced test results were based.

8. It is also evident that some of the teachers are so oriented toward norm-referenced comparisons of pupils and classroom achievement that they did not see the purpose in having objectives and items for the tests that had not been covered in the classroom.

9. A question on the "Survey of Teacher Opinion II" asked about the helpfulness of the post-test workshop. The Survey responses of teachers who did not attend a workshop differed from those teachers who did attend, in terms of opinions about the usefulness of test results for classroom instruction. For instance, 48% of the respondents who indicated they did not attend a workshop

stated that the test results were not particularly helpful for classroom instruction while 38% of those who attended workshops gave the same response.

10. The voluntary participation of the regional education service centers and schools selected in the assessment study was excellent. Each of the 20 education service centers and almost all of the schools that were selected cooperated in this study.

APPENDIX A

LONG-RANGE PLANS FOR NEEDS ASSESSMENT

An increasing demand for accountability of public school education has resulted in the assessment and evaluation of educational programs in Texas to determine the extent to which they are meeting the needs of learners. The underlying assumption is that these programs can be designed more adequately when the educational needs of learners have been identified. The Texas Education Agency has placed considerable emphasis on needs assessment as an integral part of comprehensive planning in Texas.

Long-range plans for educational needs assessment are based upon the idea that the Texas Education Agency will initiate needs assessment activities concommitantly with the regional education service centers and schools. Each statewide assessment activity proposed (or completed) deals with (a) a specific area of concern, (b) target populations, and (c) period of time. Although the assessment activities vary from year to year, these dimensions are useful for long-range planning of assessment activities.

The areas of concern in which the Texas Education Agency has long-range plans for needs assessment are:

1. Status of needs assessment and priorities among learner needs in Texas public schools
2. Academic preparation of seniors for college and seniors' evaluation/aspiration of school and work
3. Intellectual discipline — status of pupils in reading and mathematics
4. Career Education
5. Personal and social relations — affective behavior
6. Learner behaviors chosen as other areas of concern .

Each assessment area may undergo four different phases of development :

PHASE I: Planning-Context Feasibility — to determine whether it is possible or practical to conduct needs assessment in a given area of concern.

PHASE II: Pilot Testing — to determine the utility of needs assessment in a given area of concern.

PHASE III: Operational Assessment — statewide assessment of the given area of concern.

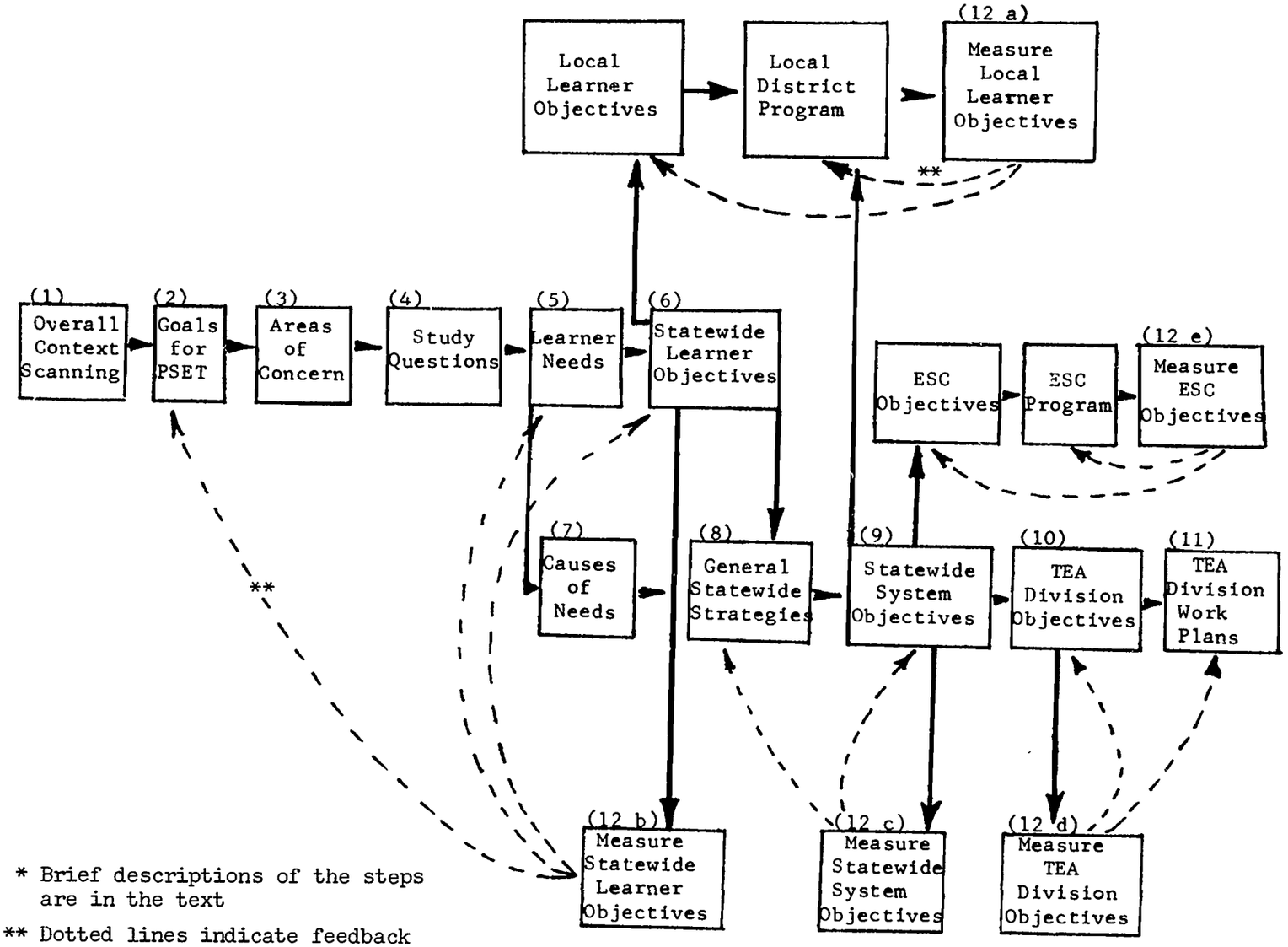
PHASE IV: Statewide Application — decision-making about elementary and secondary education system revisions based on assessment results.

Each year the needs assessment activities will culminate in the identification of critical learner needs and provide (new) baseline data for the reassessment cycle. As additional areas of concern are identified, the activities in the Long-Range Plan for Educational Needs Assessment will be modified. This long-range plan is designed in such a way that educators will receive timely information for comprehensive planning of educational programs based on identified educational needs of learners.

The accompanying chart shows the framework for statewide educational planning. Steps which are involved follow:

Step	Description
1	Overall Context Scanning is the function of investigating the environment in which education must operate in the next few years; includes forecasting and identification of trends and counter-trends.
2	Goals for Public School Education in Texas (GPSET) were adopted in October 1970; annual review is based on evaluative findings and context scanning results.
3	Areas of Concern are selected from the goals for priority attention by management since every area of education cannot be dealt with simultaneously.
4	Study Questions are developed for each area of concern selected in order to guide the collection of relevant information upon which decisions will be made concerning future action.

FRAMEWORK FOR STATEWIDE EDUCATIONAL PLANNING *



* Brief descriptions of the steps are in the text

** Dotted lines indicate feedback

Step	Description
5	Learner Needs are identified as a result of needs assessment studies using the study questions as a guide for information collection; needs are defined as the discrepancies between current status and desired conditions.
6	Statewide Learner Objectives are established by the Texas Education Agency (TEA) in partnership with school districts, regional education service centers, colleges and universities, and other interested groups; these learner objectives are a portion of the objectives sought by Texas school districts.
7	Causes of Needs are determined to provide a basis for developing strategies to alleviate the needs.
8	General Statewide Strategies are selected to move toward desired conditions.
9	Statewide System Objectives are organizational objectives (not pupil objectives) which when achieved should contribute to the attainment of the statewide learner objectives. The Agency, school districts, education service centers and other educational organizations in Texas could have a set of objectives focused on an identified set of learner needs.
10	TEA Division Objectives are designed to unify the efforts of the organization and to apportion the work to the various administrative units.
11	TEA Division Work Plans are developed to accomplish the Agency's part of the statewide system objectives.
12	Evaluation is concerned with measuring the attainment of learner, system, and TEA division objectives. As indicated, feedback loops serve for renewal of goals, needs assessments, and learner objectives.

APPENDIX B

1971 Texas Assessment of Reading and Mathematics

PUPIL IDENTIFICATION FORM

NAME (PLEASE PRINT) _____ TEACHER'S LAST NAME _____

SCHOOL NAME _____ REGION _____ SCHOOL CODE NUMBER _____

PLEASE CHECK (√) YOUR ANSWERS TO THE FOLLOWING QUESTIONS.

1. Am I in a migrant program in a migrant school? (1) ☐ No (2) ☐ Yes

2. To which group do I belong?

   (1) ☐ Mexican-American (2) ☐ Other Spanish-surnamed American

   (3) ☐ American Indian (4) ☐ Oriental (5) ☐ Negro (6) ☐ Other

3. Have I been in a Special Education Program? (Read *all* the sentences and choose the one that fits you best.)

   (1) ☐ I have *not* been in a Special Education Program at any time.

   (2) ☐ I am *not* in one now, but I have been in a program before.

   (3) ☐ I am in a program now, but I have *not* been in one before.

   (4) ☐ I am in a program now, and I have been in one before.

---

4. Outside of school, how long do I usually watch TV on each school day?

   (1) ☐ None (2) ☐ 1 or 2 hours (3) ☐ 3 or 4 hours (4) ☐ 5 or 6 hours

   (5) ☐ More than 6 hours

5. Am I a good reader? (1) ☐ No (2) ☐ Yes

6. Am I good in arithmetic? (1) ☐ No (2) ☐ Yes

7. Do I read books for fun, even when they are not for school? (1) ☐ No (2) ☐ Yes

8. How many books do we have at home? (Read *all* the sentences and choose the one that fits you best.)

   (1) ☐ We have *no* encyclopedias and *less* than 25 other books.
   (2) ☐ We have *no* encyclopedias, but we have 25 or more other books.
   (3) ☐ We have some encyclopedias and *less* than 25 other books.
   (4) ☐ We have some encyclopedias and 25 or more other books.

9. Do we get a daily newspaper, or magazines in the mail? (Read *all* the sentences and choose the one that fits you best.)

   (1) ☐ We get *no* newspapers and *no* magazines.
   (2) ☐ We get *no* newspapers, but we get magazines.
   (3) ☐ We get *no* magazines, but we get a daily newspaper.
   (4) ☐ We get magazines and a daily newspaper.

APPENDIX C

COMPARISON OF REGIONAL POPULATIONS AND SAMPLES

CAMPUSES ON WHICH THE PMI WAS ADMINISTERED

Region	Title I	Large City		Small City		Town		Suburb		Rural		Total	
		*R	**S	R	S	R	S	R	S	R	S	R	S
1	Yes	0	0	19	2	38	5	0	0	31	3	88	10
	No	0	0	4	0	7	1	0	0	3	0	14	1
2	Yes	19	2	1	0	21	2	0	0	16	2	57	6
	No	26	3	0	0	10	1	4	0	11	1	51	5
3	Yes	0	0	0	0	17	2	0	0	25	2	42	4
	No	0	0	0	0	12	1	0	0	6	1	18	2
4	Yes	43	4	6	1	21	2	4	0	11	1	85	8
	No	141	13	4	0	23	2	27	3	5	1	200	19
5	Yes	0	0	15	2	8	1	1	0	16	1	40	4
	No	0	0	15	2	13	1	4	0	2	0	34	3
6	Yes	0	0	0	0	28	2	0	0	35	4	63	6
	No	0	0	0	0	6	0	0	0	2	0	8	0
7	Yes	0	0	10	1	54	5	2	0	48	4	114	10
	No	0	0	5	1	14	1	2	0	8	1	29	3
8	Yes	0	0	4	0	18	2	4	1	34	4	60	7
	No	0	0	0	0	11	1	0	0	3	0	14	1
9	Yes	0	0	6	1	15	2	0	0	19	2	40	5
	No	0	0	14	1	5	0	0	0	4	0	23	1
10	Yes	20	1	15	2	36	4	11	2	24	1	106	110
	No	113	10	14	2	21	2	52	5	8	1	208	20
11	Yes	12	1	4	0	21	2	12	1	47	5	96	9
	No	10	1	16	2	29	3	17	2	3	0	75	8

*Region
**Sample

CAMPUSES ON WHICH THE PMI WAS ADMINISTERED, CONTINUED

Region	Title I	Large City		Small City		Town		Suburb		Rural		Total	
		R	S	R	S	R	S	R	S	R	S	R	S
12	Yes	0	0	10	1	34	6	3	1	58	3	105	11
	No	0	0	13	1	18	2	1	0	1	0	33	3
13	Yes	16	2	0	0	34	3	1	0	26	2	77	7
	No	38	4	0	0	6	1	2	0	6	1	52	6
14	Yes	0	0	7	1	26	3	1	0	30	3	64	7
	No	0	0	14	1	7	1	0	0	4	0	25	2
15	Yes	0	0	5	1	14	1	0	0	30	3	49	5
	No	0	0	11	1	8	1	0	0	3	0	22	2
16	Yes	0	0	21	2	33	3	1	0	29	3	84	8
	No	0	0	13	1	6	1	1	0	18	2	38	4
17	Yes	0	0	11	1	20	3	0	0	40	3	71	7
	No	0	0	26	3	8	1	0	0	8	1	42	5
18	Yes	0	0	16	1	11	2	0	0	7	1	34	4
	No	0	0	24	2	25	2	0	0	15	2	64	6
19	Yes	14	1	0	0	2	0	0	0	6	1	22	2
	No	27	3	0	0	0	0	0	0	1	0	28	3
20	Yes	71	7	0	0	19	2	5	1	20	1	115	11
	No	32	2	0	0	12	1	13	2	8	1	65	6
State	Yes	195	18	150	16	470	53	45	6	552	49	1412	142
	No	387	37	173	18	241	23	123	11	119	11	1043	100

PUPILS RESPONDING TO THE PMI

ESC Region	Population of Sixth-Grade Level Pupils, Fall 1971	PMI Respondents	% of Population	ESC Region	Population of Sixth-Grade Level Pupils, Fall, 1971	PMI Respondents	% of Population
1	9187	1159	12.6	11	18623	1919	10.3
2	9300*	1082	11.6	12	7732	964	12.5
3	4735	528	11.2	13	9975	768	7.7
4	43362	4307	9.9	14	4245	371	8.7
5	8014	702	8.8	15	3626	395	10.9
6	5530	486	8.8	16	6695	658	9.8
7	10539	1076	10.2	17	7311	787	10.8
8	4141	475	11.5	18	6362	591	9.3
9	3650	415	11.4	19	9168	722	7.9
10	32178	2996	9.3	20	19747	1654	8.4
				State	224120*	22055	9.8

*In ESC Region 2 the population of pupils at the sixth-grade level is unknown; the estimate of 9300 is based on the 1970 Fall Survey.

APPENDIX D

PROCEDURES USED FOR ESTABLISHING
THE REPRESENTATIVENESS OF OBJECTIVES

Step 1 - Converting percentage values to x-values

For purposes of reporting, a score is given which is the percentage of persons mastering an objective. To establish representativeness this percentage is converted to another number that maintains the same proportionate value as the percentage and can be added and subtracted with mathematical accuracy. The percentage scores (P) are changed to "x-values," and the following formula is used for making this transition.

$$x = 20 \arcsin \sqrt{P} - 15.71$$

Step 2 - Establishing the degree of differences for factors

The following factors were used in the study:

FACTORS

A. ESEA-I funding
B. Ethnicity
C. Size of community
D. Gender
E. Perception of self in reading
F. Perception of self in arithmetic
G. Educational emphasis index

After preliminary study of the results the following decisions were made about each variable within a factor as to whether the general trend of scores would be in a positive or negative direction from the total score. The variables are listed with the decision about the direction of score given as a (+), (-), or neutral (o).

VARIABLES

x_1 - Total score (used as a constant)

A
- x_2 = Non-Title I +
- x_3 = Title I -

B
- x_4 = Other +
- x_5 = Black −
- x_6 = Mexican American −

C
- x_7 = Over 500,000 population −
- x_8 = 200,000 – 500,000 population −
- x_9 = Under 200,000 population +
- x_{10} = Suburb +
- x_0 = Rural 0

D
- x_{11} = Female +
- x_{12} = Male −

E
- x_{13} = Good in reading +
- x_{14} = Not good in reading −

F
- x_{15} = Good in arithmetic +
- x_{16} = Not good in arithmetic −

G
- x_{17} = High educational environment +
- x_{18} = Low educational environment −

The following formulas were used to establish the degree of sensitivity for each factor:

[Funding]

$$y_A = (x_1 - x_3) + (x_2 - x_1) = x_1 - x_3 + x_2 - x_1 = x_2 - x_3$$

[Ethnicity]

$$Y_B = (x_4 - x_1) + (x_1 - x_5) + (x_1 - x_6) = x_4 - x_1 + x_1 - x_5 + x_1 - x_6$$

[Size of Community]

$$Y_C = (x_1 - x_7) + (x_1 - x_8) + (x_9 - x_1) + (x_{10} - x_1)$$

$$= x_1 - x_7 + x_1 - x_8 + x_9 - x_1 + x_{10} - x_1$$

$$= x_9 + x_{10} - x_7 - x_8$$

[Gender]

$$Y_D = (x_1 - x_{12}) + (x_{11} - x_1) = x_{11} - x_{12}$$

[Self Perception - Reading]

$$Y_E = (x_{13} - x_1) + (x_1 - x_{14}) = x_{13} - x_{14}$$

[Self Perception - Mathematics]

$$Y_F = (x_{15} - x_1) + (x_1 - x_{16}) = x_{15} - x_{16}$$

[Educational Emphasis]

$$Y_G = (x_{17} - x_1) + (x_1 - x_{18}) = x_{17} - x_{18}$$

To determine the general sensitivity of each objective the individual sensitivities were incorporated into the following formula.

Y = total sensitivity score for objective

$$Y = y_A$$

$$Y = y_A + y_B + y_C + y_D + y_E + y_F + y_G$$

or

$$Y = x_2 - x_3 + x_4 - x_5 - x_6 + x_9 + x_{10} - x_7 - x_8 + x_{11} - x_{12} + x_{13} - x_{14} + x_{15} - x_{16} + x_{17} - x_{18}$$

After the Y scores were obtained, each objective was arranged in order according to this score.

APPENDIX E

LIST OF OBJECTIVES AND COMPARISONS OF RATINGS
OF THE PRESCRIPTIVE MATHEMATICS INVENTORY - LEVEL B
BY TEACHERS AND EXPERTS IN MATHEMATICS

Explanation— Each objective was rated by both teachers and mathematics experts according to these characteristics:

All - The objective is appropriate for mastery by all sixth-grade pupils or their equivalent (children usually eleven to twelve years of age). Objectives in this category are operationally defined as "basic" in this report.

Many - The objective is appropriate for mastery by many sixth-grade pupils or their equivalent. It is desirable for continuance in education but not basic.

Few - The objective is appropriate for mastery by few sixth-grade pupils or their equivalent—probably those headed for mathematically oriented programs.

The consensus classification for each objective by each group was derived by first weighting the responses, i.e. 1 for the "All" classification, 2 for "Many," and a 3 for "Few," and then calculating a mean of the weights given each objective. An objective was placed in the "All" (basic) category if its mean was 1.5 or less, in the "Many" category if it had a mean of 1.5 to 2.5, and in the "Few" category if it received a mean rating above 2.5.

The third column gives the percentages of sixth-grade students who mastered each Prescriptive Mathematics Inventory - Level B objective.

	Rating by Teachers	Rating by "Experts"	% of students mastering each objective
Operations on the Number Line			
1. Given a number line with units divided into fourths, the student will specify a given point on the line as a mixed number. (Concept question)	Many	All	30%
*2. Given a number line showing the operation of addition of whole numbers and an appropriate open mathematical sentence, the student will complete the mathematical sentence to describe the operation.	All	All	49%

*Basic Objective

	Rating by Teachers	Rating by "Experts"	% of students mastering each objective
Operations on the Number Line continued			
3. Given a number line showing the operation of subtraction of whole numbers and an appropriate open mathematical sentence, the student will complete the mathematical sentence to describe the operation.	Many	All	42%
4. Given a number line showing the operation of addition of mixed numbers and an appropriate open mathematical sentence, the student will complete the mathematical sentence to describe the operation.	Many	All	8%
5. Given a number line showing the operation of subtraction of mixed numbers and an appropriate open mathematical sentence, the student will complete the mathematical sentence to describe the operation.	Many	All	10%
6. Given a number line showing the operation of multiplication of mixed numbers and an appropriate open mathematical sentence, the student will complete the mathematical sentence to describe the operation.	Many	All	5%
7. Given a number line showing the operation of division of mixed numbers and an appropriate open mathematical sentence, the student will complete the mathematical sentence to describe the operation.	Many	Many	4%

	Rating by Teachers	Rating by "Experts"	% of students mastering each objective
Operations on the Number Line continued			
8. Given a number line showing positive and negative integers, the student will specify a given point on the line as negative integer.	Few	Many	23%
Addition of Whole Numbers			
* 9. The student will be able to add 4-digit whole numbers with regrouping.	All	All	66%
* 10. The student will be able to add 5-digit whole numbers with regrouping.	All	All	75%
* 11. The student will be able to add a column of 5 or fewer 3-digit whole numbers with regrouping.	All	All	67%
Subtraction of Whole Numbers			
* 12. The student will be able to subtract a 2-digit whole number from a 2-digit whole number with regrouping.	All	All	76%
* 13. The student will be able to subtract a 3-digit whole number from a 3-digit whole number with regrouping.	All	All	70%
* 14. The student will be able to subtract a 4-digit whole number from a 4-digit whole number with regrouping.	All	All	60%
* 15. The student will be able to subtract a 5-digit whole number from a 5-digit whole number with regrouping.	All	All	57%

	Rating by Teachers	Rating by "Experts"	% of students mastering each objective
Multiplication of Whole Numbers			
*16. The student will be able to write a given repeated addition problem as a multiplication problem and compute the answer.	All	All	48%
17. The student will be able to find the total number of elements in a rectangular array by using multiplication.	All	All	82%
*18. The student will be able to multiply a 1-digit whole number by a 1-digit whole number. (Basic facts).	All	All	66%
*19. The student will be able to multiply a 2-digit whole number by a 1-digit whole number.	All	All	78%
*20. The student will be able to multiply a 3-digit whole number by a 1-digit whole number.	All	All	62%
*21. The student will be able to multiply a 4-digit whole number by a 1-digit whole number.	All	All	53%
22. The student will be able to multiply a 2-digit whole number by a 2-digit whole number.	Many	All	59%
23. The student will be able to multiply a 3-digit whole number by a 2-digit whole number.	Many	All	40%
24. The student will be able to multiply a 3-digit whole number by a 3-digit whole number.	Many	All	32%

	Rating by Teachers	Rating by "Experts"	% of students mastering each objective
Multiplication of Whole Numbers continued			
25. The student will be able to multiply a 4-digit whole number by a 3-digit whole number.	Many	Many	32%
26. The student will identify the number of zeros after a single digit that are appropriate to represent multiplication of that digit by a given power of ten.	Many	Many	68%
27. Given a 2-digit whole number with an exponent of 2, the student will multiply the number by itself.	Many	Many	10%
Division of Whole Numbers			
* 28. The student will be able to divide a 2-digit whole number by a 1-digit whole number with no remainder. (Basic facts)	All	All	73%
* 29. The student will be able to divide a 3-digit whole number by a 1-digit whole number with no remainder.	All	All	41%
* 30. The student will be able to divide a 2-digit whole number by a 1-digit whole number with remainder.	All	All	58%
* 31. The student will be able to divide a 3-digit whole number by a 1-digit whole number with remainder.	All	All	55%
32. The student will be able to divide a 2-digit whole number by a 2-digit whole number with remainder.	Many	All	-1-

-1- The test item did not measure the objective .

	Rating by Teachers	Rating by "Experts"	% of students mastering each objective
Division of Whole Numbers continued			
*33. The student will be able to divide a 3-digit whole number by a 2-digit whole number with remainder.	All	All	32%
*34. The student will be able to divide a 4-digit whole number by a 1-digit whole number with remainder.	All	All	32%
35. The student will be able to divide a 4-digit whole number by a 2-digit whole number with remainder.	Many	All	33%
36. The student will be able to divide a 5-digit whole number by a 2-digit whole number with remainder.	Many	Many	33%
37. The student will represent the quotient as a power of ten when a multiple of a power of ten is divided by its factor that is not a power of ten.	Few	Many	61%
Addition of Positive Fractions			
*38. Given a rectangle that has been divided into a number of equal squares of which some are shaded, the student will specify the fractional part of the rectangle that is shaded. (Pictorial fractions)	All	All	36%
39. The student will convert a fraction expressed in lowest terms into higher terms. (Equivalence)	Many	All	24%
*40. The student will be able to rename a fraction by reducing the numerator and denominator to lowest terms.	All	All	14%

	Rating by Teachers	Rating by "Experts"	% of students mastering each objective
Addition of Positive Fractions continued			
* 41. The student will be able to add 3 like fractions without re-grouping.	All	All	75%
42. The student will be able to add 2 unlike fractions without re-grouping.	Many	All	17%
43. The student will be able to add 2 mixed numbers without regrouping.	Many	All	16%
44. The student will be able to add 2 like fractions with regrouping.	All	All	24%
45. The student will be able to add 3 unlike fractions with regrouping.	Many	Many	13%
46. The student will be able to add 2 mixed numbers with regrouping.	Many	Many	13%
Subtraction of Positive Fractions			
* 47. The student will be able to subtract like fractions without regrouping.	All	All	48%
48. The student will be able to subtract unlike fractions without regrouping.	Many	All	13%
49. The student will be able to subtract mixed numbers without regrouping.	Many	Many	9%
* 50. The student will be able to subtract like fractions with regrouping.	All	All	9%
51. The student will be able to subtract mixed numbers with regrouping.	Many	Many	7%

	Rating by Teachers	Rating by "Experts"	% of students mastering each objective
Multiplication of Positive Fractions			
52. Given three numbers, the student will find the greatest common factor.	Many	Many	20%
53. Given 3 numbers, the student will find the least common multiple.	Many	Many	1%
54. Given 4 fractions, the student will find the lowest common denominator.	Many	Many	3%
55. The student will be able to multiply a proper fraction by a proper fraction.	Many	All	38%
56. The student will be able to multiply a whole number by a proper fraction.	Many	All	22%
57. The student will be able to multiply a whole number by a mixed number.	Many	All	10%
58. The student will be able to multiply a proper fraction by a mixed number.	Many	Many	1%
59. The student will be able to multiply a mixed number by a mixed number.	Many	Many	1%
Division of Positive Fractions			
60. The student will be able to divide a proper fraction by a proper fraction.	Many	All	1%
61. The student will be able to divide a whole number by a proper fraction.	Many	All	3%

	Rating by Teachers	Rating by "Experts"	% of students mastering each objective
Division of Positive Fractions continued			
62. The student will be able to divide a proper fraction by a whole number.	Many	Many	1%
63. The student will be able to divide a whole number by a mixed number.	Many	Many	1%
64. The student will be able to divide a mixed number by a whole number.	Many	Many	1%
65. The student will be able to divide a proper fraction by a mixed number.	Many	Many	1%
66. The student will be able to divide a mixed number by a proper fraction.	Many	Many	1%
67. The student will be able to divide a mixed number by a mixed number.	Many	Many	1%
Addition of Decimal Numbers			
68. The student will be able to convert a proper fraction to a decimal fraction. (Equivalence)	Many	All	3%
69. The student will be able to add 2 dec. fractions each with 1 dec. place without regrouping.	Many	All	67%
70. The student will be able to add 2 dec. fractions each with 2 dec. places without regrouping.	Many	All	63%
71. The student will be able to add 2 dec. fractions each with 3 dec. places without regrouping.	Many	All	57%

	Rating by Teachers	Rating by "Experts"	% of students mastering each objective
Addition of Decimal Numbers continued			
72. The student will be able to add 2 dec. fractions each with 1 dec. place with regrouping.	Many	All	-1-
73. The student will be able to add 2 dec. numbers each with 2 dec. places with regrouping.	Many	All	48%
74. The student will be able to add 2 dec. fractions each with 3 dec. places with regrouping.	Many	Many	57%
Subtraction of Decimal Numbers			
*75. The student will be able to subtract a 1-digit dec. fraction from a 1-digit dec. fraction without regrouping.	All	All	72%
76. The student will be able to subtract a 2-digit dec. fraction from a 2-digit dec. fraction without regrouping.	Many	All	63%
77. The student will be able to subtract a 1-digit dec. fraction from a dec. number with 1-dec. place with regrouping.	Many	All	43%
78. The student will be able to subtract a dec. number with 2 dec. places from another dec. number with 2 dec. places with regrouping.	Many	All	37%
79. The student will be able to subtract a 3-digit dec. fraction from a 3-digit dec. fraction with regrouping.	Many	Many	47%

-1- The test item did not measure the objective.

	Rating By Teachers	Rating by "Experts"	% of Students mastering each objective
Multiplication of Decimal Numbers			
80. The student will be able to multiply a 2-digit whole number by a 1-digit dec. fraction.	Many	All	40%
81. The student will be able to multiply a 2-digit whole number by a 2-digit dec. fraction.	Many	All	32%
82. The student will be able to multiply a 3-digit dec. fraction by a 2-digit whole number.	Many	Many	30%
83. The student will be able to multiply a 1-digit dec. fraction by a 1-digit dec. fraction.	Many	Many	32%
84. The student will be able to multiply a 2-digit dec. fraction by a 1-digit dec. fraction.	Many	Many	6%
85. The student will be able to multiply a 2-digit dec. fraction by a 2-digit dec. fraction.	Many	Many	4%
86. The student will be able to multiply a 3-digit dec. fraction by a 2-digit dec. fraction.	Many	Many	11%
87. The student will be able to multiply a dec. number with 2 dec. places by a dec. number with 1 dec. place.	Many	Many	9%
Division of Decimal Numbers			
88. The student will be able to divide a 2-digit dec. fraction by a 1-digit dec. fraction.	Many	All	60%

	Rating by Teachers	Rating by "Experts"	% of students mastering each objective
Division of Decimal Numbers continued			
89. The student will be able to divide a 3-digit dec. fraction by a 2-digit dec. fraction.	Many	Many	31%
90. The student will be able to divide a dec. number with 1-dec. place by a 2-digit dec. fraction.	Many	Many	0%
91. The student will be able to divide a 1-digit dec. fraction by a 1-digit whole number.	Many	Many	1%
92. The student will be able to divide a 2-digit dec. fraction by a 1-digit whole number.	Many	Many	34%
93. The student will be able to divide a 3-digit dec. fraction by a 2-digit whole number.	Many	Many	5%
94. The student will be able to divide a 2-digit whole number by a 1-digit dec. fraction.	Many	Many	1%
95. The student will be able to divide a 3-digit whole number by a 2-digit dec. fraction.	Many	Many	0%
96. The student will be able to divide a 3-digit whole number by a 3-digit dec. fraction.	Many	Many	0%
97. The student will be able to divide a mixed decimal number with 3 dec. places by a mixed dec. number with 2 dec. places.	Many	Many	1%

	Rating by Teachers	Rating by "Experts"	% of students mastering each objective
Negative Integers			
* 98. The student will be able to add two 1-digit negative integers.	All	All	39%
99. The student will be able to subtract a 1-digit negative integer from a 2-digit whole number.	Many	Many	1%
100. The student will be able to multiply a negative integer by a negative integer.	Few	Many	13%
101. The student will be able to divide a 2-digit whole number by a negative integer.	Few	Many	40%
Rounded Numbers (Estimation)			
102. The student will be able to round off a 5-digit number to the nearest 10,000.	All	Many	26%
103. The student will be able to estimate the answer to an addition problem to the nearest thousand.	Many	Many	17%
104. The student will be able to estimate the answer to a subtraction problem to the nearest hundred.	Many	Many	21%
105. The student will be able to estimate the answer to a multiplication problem to the nearest hundred.	Many	Many	22%
106. The student will be able to estimate the answer to a division problem to the nearest ten.	Many	Many	8%

	Rating by Teachers	Rating by "Experts"	% of students mastering each objective
Commutative Property			
107. Given an addition problem with two positive fractions as addends the student will be able to supply the missing factor in the commuted form of the problem.	Many	Many	32%
108. Given a multiplication problem with 2 positive fractions as factors, the student will be able to supply a missing factor in the commuted form of the problem.	Many	Many	37%
Associative Property			
109. Given an open addition equation with 3 literal fractions as addends parenthesized to show a particular grouping of addends, the student will be able to supply a missing addend in the equation parenthesized to show a different grouping of addends.	Many	Many	43%
110. Given a multiplication problem with 3 positive fractions as factors parenthesized to show a particular grouping of factors, the student will be able to supply a missing factor in the problem parenthesized to show a different grouping of factors.	Many	Many	37%
Distributive Property			
111. Given an equation in whole numbers with a missing factor, the student will be able to apply the distributive property in supplying the missing factor.	Many	Many	34%

	Rating by Teachers	Rating by "Experts"	% of students mastering each objective
Distributive Property continued			
112. Given an equation with a missing factor, where the sum is implicit in a mixed number, the student will be able to apply the distributive property in supplying the missing factor.	Many	Many	39%
Identity Element			
113. The student will be able to supply a zero as the identity element in an unfinished mathematical sentence involving the addition of whole numbers.	All	Many	71%
114. The student will be able to supply the number 1 as the identity element in an unfinished mathematical sentence involving the multiplication of whole numbers.	All	Many	56%
115. The student will be able to supply a zero as the identity element in an unfinished mathematical sentence involving addition of positive fractions.	All	Many	65%
116. The student will be able to supply the number 1 as the identity element in an unfinished mathematical sentence involving the multiplication of positive fractions.	Many	Many	48%
Inverse Relation			
117. The student will be able to supply a missing whole number in a pair of unfinished mathematical sentences illustrating the inverse relationship between addition and subtraction.	Many	Many	55%

	Rating by Teachers	Rating by "Experts"	% of students mastering each objective
Inverse Relation continued			
118. The student will be able to supply a missing positive fraction in a pair of unfinished mathematical sentences illustrating the inverse relationship between multiplication and division.	Many	Many	21%
Number Sequences			
119. Given a sequence of whole numbers in which the alternate terms are in arithmetic progression with a negative difference, the student will by able to supply the numbers missing from the sequence.	Many	Many	44%
120. Given a sequence of whole numbers involving multiplication by a constant value, the student will be able to supply a missing number from the sequence.	Many	Many	17%
121. Given a sequence of whole numbers involving division by a constant value, the student will be able to supply a missing number from the sequence.	Many	Many	29%
122. Given a sequence of positive fractions with like denominators and with numerators progressively increasing by a constant value, the student will be able to supply a missing number from the sequence.	Many	Many	66%

	Rating by Teachers	Rating by "Experts"	% of students mastering each objective
Number Sequences continued			
123. Given a sequence of positive fractions with like denominators and with numerators progressively decreasing by a constant value, the student will be able to supply a missing number from the sequence.	Many	Many	54%
124. Given a sequence of positive fractions involving multiplication by a constant fractional value, the student wil be able to supply a missing number from the sequence.	Many	Many	5%
125. Given a sequence of positive fractions involving division by a constant value, the student will be able to supply a missing number from the sequence.	Many	Many	16%
Missing Addends and Factors (Transform)			
126. Given an addition problem with 2 addends and their sum but the digits missing from 1 addend, the student will be able to supply the missing digits.	Many	Many	58%
127. Given a completed subtraction problem with missing digits in the subtrahend and the difference, the student will be able to supply the missing digits.	Many	Many	56%
128. Given a multiplication problem with its product but with one missing factor, the student will be able to supply the missing factor.	Many	Many	29%

	Rating by Teachers	Rating by "Experts"	% of students mastering each objective
Missing Addends and Factors (Transform) continued			
129. Given a division problem with its quotient but with digits missing from the dividend, the student will be able to supply the missing digits.	Many	Many	4%
Number Theory			
130. Given a set of whole numbers, the student will be able to select those which are prime numbers.	Many	Many	1%
131. Given a set of whole numbers, the student will be able to select those which are composite.	Many	Many	2%
132. Given a sequence of odd numbers, the student will be able to supply additional terms in the sequence.	Many	Many	60%
Mathematical Sentences			
133. The student will be able to specify all the whole numbers that fall between 2 given whole numbers. (Inequalities)	Many	Many	21%
Measurement			
134. Given a ruler marked off into half units, the student will be able to estimate the length of any given object to the nearest half unit.	Many	All	42%

		Rating by Teachers	Rating by "Experts"	% of students mastering each objective
	Measurement continued			
135.	Given an arbitrary unit of length, the student will be able to measure the length of a given object as a number of these units. (non-standard units)	Many	All	28%
136.	The student will be able to convert a given length expressed in inches to its equivalent in centimeters. (Metric system)	Few	Many	25%
* 137.	The student will be able to use a ruler to measure an object's length.	All	All	41%
* 138.	The student will be able to add lengths expressed in inches and convert the sum to feet and inches.	All	All	31%
139.	The student will be able to subtract lengths expressed in yards, feet, and inches with regrouping.	Many	Many	4%
* 140.	Given an illustration of a liquid thermometer, the student will be able to specify the temperature to the nearest degree.	All	All	38%
141.	Given a drawing of a rectangle with dimensions marked the student will be able to compute the perimeter.	Many	All	5%

		Rating by Teachers	Rating by "Experts"	% of students mastering each objective
Measurement continued				
142.	Given a drawing of an area that has been subdivided into uniform squares, the student will be able to find the area of the figure as the number of these square units.	Few	All	28%
143.	Given a drawing of a geometric volume which has been subdivided into uniform cubes, the student will be able to find the volume of the figure as the number of these cubic units.	Few	Many	27%
144.	The student will be able to identify a right angle by sight and specify its measure as 90 degrees.	Many	Many	6%
145.	Given a line graph, the student will be able to read the value of a point on the line.	Many	All	43%
* 146.	Given an illustration of pieces of money, both bills and coins, the student will be able to count the total amount.(Concept question)	All	All	58%
* 147.	The student will be able to add expressed amounts of money.	All	All	61%
* 148.	The student will be able to subtract expressed amounts of money.	All	All	62%

		Rating by Teachers	Rating by "Experts"	% of students mastering each objective
Measurement continued				
* 149.	The student will be able to multiply an expressed amount of money by a whole number.	All	All	60%
150.	The student will be able to divide an expressed amount of money by a whole number.	Many	All	14%
151.	The student will be able to convert liquid measures from gallons to quarts. (Concept question)	Many	All	38%
152.	The student will be able to add quantities of liquid expressed as gallons and quarts with regrouping.	Many	Many	36%
153.	The student will be able to subtract quantities of liquid expressed as quarts and pints with regrouping.	Many	Many	28%
154.	The student will be able to convert measures of weight from pounds to ounces. (Concept question)	Many	Many	48%
155.	The student will be able to add quantities of weight expressed as pounds and ounces with regrouping.	Many	Many	--1--
156.	The student will be able to subtract quantities of weight expressed as pounds and ounces with regrouping.	Many	Many	06%
* 157.	Given an illustration of a clock, the student will be able to specify the time shown. (Concept question)	All	All	57%

-1-The test item did not measure the objective.

	Rating by Teachers	Rating by "Experts"	% of students mastering each objective
Measurement continued			
158. The student will be able to add quantities of time expressed as hours, minutes, and seconds with regrouping.	All	Many	13%
159. The student will be able to subtract quantities of time expressed as hours and minutes with regrouping.	Many	Many	15%
160. Given the day of the week on which a particular date falls, the student will be able to name the date a given number of weeks later. (Calendar)	Many	Many	33%
Place Value			
161. Given the values of the tens' and units' positions of a numeral, the student will write the numeral. (0-999)	Many	All	81%
162. The student will specify the value of any digit in a 5 place numeral. (1,000-99,999)	Many	All	43%
163. The student will specify the value of any digit in a 9 place numeral. (100,000-999,999,999)	Many	Many	39%
164. The student will specify the value of any digit in a numeral with 3 dec. places.(0.0-.999)	Many	Many	5%
165. The student will specify the value of any digit in a numeral with 5 dec. positions. (0.0-.99999)	Few	Many	4%

		Rating by Teachers	Rating by "Experts"	% of students mastering each objective
	Place Value continued			
* 166.	Given the expanded form of a 3-digit numeral, the student will write the numeral. (Expanded notation.)	All	All	81%
167.	Given the expanded form of a 4-digit numeral, the student will write the numeral. (Expanded notation)	Many	Many	76%
168.	Given the expanded form of a 5-digit numeral in powers of ten, the student will write the numeral. (Exponential notation)	Many	Many	37%
	Numeration Systems			
169.	The student will convert a Roman Numeral containing only the symbols I and X to its equivalent Arabic numeral. (Roman numerals)	Many	Many	41%
170.	The student will convert a Roman numeral containing only the symbols L and C to its equivalent Arabic numeral. (Roman numerals)	Many	Many	44%
171.	The student will convert a Roman numeral containing only the symbols D and M to its equivalent Arabic numeral. (Roman numerals)	Many	Many	38%
172.	The student will convert a base-ten numeral to its equivalent base-two numeral. (Concept question)	Many	Few	4%

	Rating by Teachers	Rating by "Experts"	% of students mastering each objective
Numeration Systems continued			
173. The student will add 2 base-two numerals.	Many	Few	16%
174. The student will subtract a base-two numeral from a numerically larger base-two numeral.	Few	Few	20%
175. The student will convert a base-ten numeral to its equivalent base-five numeral. (Concept question)	Many	Few	5%
176. The student will add two base-five numerals.	Many	Few	10%
177. The student will subtract a base-five numeral from a numerically larger base-five numeral.	Many	Few	4%
178. The student will convert a base-six numeral to its equivalent base-ten numeral.	Few	Few	1%
179. The student will convert a base-eight numeral to its equivalent base-ten numeral. (Concept question)	Many	Few	2%
180. The student will add two base-eight numerals.	Many	Few	6%
181. The student will subtract a base-eight numeral from a numerically larger base-eight numeral.	Few	Few	2%

		Rating by Teachers	Rating by "Experts"	% of students mastering each objective
	Numeration Systems continued			
182.	Given a 2-digit base-ten numeral, the student will find its value as a modular 5 numeral. (Concept question)	Few	Few	6%
183.	The student will specify missing numerals in a matrix for a modular 3 system under addition.	Few	Few	15%
184.	The student will specify missing numerals in a matrix for a modular 3 system under multiplication.	Few	Few	16%
	Non-metric Geometry			
* 185.	Given a set of geometric drawings, the student will be able to select the one that represents a line segment.	All	All	47%
186.	The student will be able to state the number of lines of symmetry a square has.	Many	Many	5%
187.	Given a set of geometric drawings, the student will be able to select the one that represents a prism.	Many	Many	43%
188.	Given a set of geometric drawings, the student will be able to select the one that represents a ray.	Many	Many	20%
189.	Given a set of geometric drawings, the student will be able to select the one representing the intersection of two planes.	Many	Many	37%

		Rating by Teachers	Rating by "Experts"	% of students mastering each objective
Non-metric Geometry continued				
*190.	Given a set of geometric drawings, the student will be able to select the one that represents parallel lines.	All	All	41%
191.	Given a set of geometric drawings, the student will be able to select the one that represents congruence.	Many	Many	52%
192.	Given a mathematical sentence expressing the equality of the product of two symbolic quantities with the product of two other symbolic quantities, the student will be able to express true proportions using these four quantities. (Ratio and Proportion)	Many	Few	13%
193.	Given the scale of a map, the student will be able to compute the distance between any two points.	Many	Many	8%
194.	Given a drawing representing a map with latitude and longitude labeled, the student will be able to specify the coordinates of a given point on the map.	Few	Many	11%
195.	Given a set of geometric drawings, the student will be able to select the one that represents the Pythagorean Theorem.	Few	Many	38%

		Rating by Teachers	Rating by "Experts"	% of students mastering each objective
	Non-metric Geometry continued			
196.	Given a set of geometric drawings, the student will be able to select the one that represents a quadrilateral which is also a parallelogram and a rhombus. (Polygon classification)	Many	Many	6%
197.	Given a Cartesian coordinate grid, the student will be able to name a given point as an ordered pair of numbers.	Few	Many	16%
	Percent			
* 198.	The student will be able to convert a number written as a fraction with denominator 100 to percent form. (Denominator of 100)	All	All	27%
199.	The student will be able to convert a number written as a percent to a fraction. (Equivalent ratios)	Many	Many	10%
200.	The student will be able to convert a number written as a dec. number to its equivalent percent form. (Percents between 0 and 100)	Many	Many	1%
201.	The student will be able to convert a number written as a fraction with denominator 1000 to percent form. (Percents less than 1)	Few	Many	17%

	Rating by Teachers	Rating by "Experts"	% of students mastering each objective
Percent continued			
202. The student will be able to convert a number greater than unity written as a fraction to percent form. (Percents greater than 100)	Few	Many	12%
203. The student will be able to compute a given percent of a given whole number. (Applications)	Many	Many	0%
Sets			
* 204. Given a set of less than 10 elements, the student will count the elements. (Pictorial sets)	All	All	94%
* 205. Given a set containing whole numbers as elements, the student will identify all elements that are "more than" or "less than" a given number. (Listing elements.)	All	All	85%
206. Given two finite sets, the student will specify the set that is the union of these sets. (Union)	Many	All	22%
207. Given two finite sets, the student will specify the set that is the intersection of these sets. (Intersection)	Many	Many	45%
208. Given 2 sets of objects, the student will find the number of pairings possible when each element of the first set is paired with each element of the second set. (Cartesian product)	Many	Many	66%

	Rating by Teachers	Rating by "Experts"	% of students mastering each objective
Statistics			
209. Given a set of whole numbers, the student will be able to compute their average. (Mean)	All	Many	20%
210. Given a set of whole numbers, the student will be able to find their range.	Many	Many	1%
Probability			
211. Given the number of each of two kinds of objects in a container, the student will be able to compute the probability of selecting one of a given kind at random. (Simple events)	Many	Many	2%
Reasoning			
212. Given a word problem requiring one or more fundamental operations with small whole numbers for solution, the student will be able to solve the problem.	Many	Many	45%

APPENDIX F

MATHEMATICS RESULTS BY POPULATION GROUPS

Objective Number	Operation on the Number Line	All Students	Low Educational Emphasis	High Educational Emphasis	Good in Arithmetic - No	Good in Arithmetic - Yes	Good in Reading - No	Good in Reading - Yes	Rural	Suburb	City under 200,000	City 200,000 - 500,000	City over 500,000	Other	Mexican American	Black	Non-Title I	Title I	Female	Male
1		33%	27%	44%	37%	13%	22%	35%	30%	40%	23%	24%	33%	40%	10%	10%	32%	28%	27%
2		47	51	63	56	39	42	54	44	59	43	41	52	59	41	28	52	46	51
3		41	42	57	49	29	34	47	37	51	35	30	45	51	32	22	45	38	42
4		10	7	16	12	3	4	11	7	13	8	9	12	8	3	2	10	7	9
5		11	9	18	14	5	6	13	8	14	8	12	15	8	5	2	12	9	9
6		6	4	11	7	2	3	7	5	7	4	6	8	4	2	1	6	4	4
7		4	4	7	5	1	2	5	4	4	3	4	5	3	1	1	4	3	4
8		24	22	35	28	14	17	26	20	29	17	25	30	17	8	8	24	21	22
	Addition of Whole Numbers																			
9		64	69	73	71	59	63	70	63	69	61	70	72	61	65	52	67	66	69
10		73	77	82	79	70	71	78	72	80	70	77	79	70	75	63	75	75	77
11		65	70	74	72	60	62	71	62	70	66	70	72	62	68	52	67	67	70
	Subtraction of Whole Numbers																			
12		73	78	85	82	67	69	80	71	80	66	81	83	66	74	57	74	76	78
13		68	72	80	76	60	64	74	67	74	60	74	77	60	69	49	70	70	72
14		58	62	71	67	47	53	65	57	63	50	64	68	50	57	38	60	60	62
15		54	60	74	64	44	49	62	52	68	55	62	65	47	53	34	56	56	60
	Multiplication of Whole Numbers																			
16		44	51	64	56	38	44	53	44	58	42	56	58	39	38	23	49	45	51
17		79	84	88	85	78	77	85	79	86	74	84	86	77	81	70	82	81	84
18		63	69	71	73	54	59	71	62	74	68	70	74	58	60	48	67	65	69
19		75	81	85	83	71	73	82	71	83	81	82	84	71	77	61	78	78	81
20		59	65	71	69	49	53	67	58	64	54	64	69	54	58	44	62	61	65
21		50	56	65	62	38	44	59	50	59	50	57	62	44	49	32	54	52	56
22		55	62	71	69	44	49	64	55	64	53	63	67	49	55	34	59	58	62
23		37	42	51	49	27	32	44	34	43	36	43	46	31	36	22	40	39	42
24		29	35	41	38	21	24	36	27	34	30	35	38	24	28	17	32	31	35
25		29	34	41	38	20	24	36	27	34	27	35	38	24	27	17	32	32	34
26		63	72	80	74	58	58	75	60	73	60	72	74	63	67	50	68	67	72
27		9	11	14	13	7	8	12	8	9	8	11	13	8	8	4	10	10	11

Objective Number	Male	Female	Title I	Non-Title I	Black	Mexican American	Other	City over 500,000	City 200,000 - 500,000	City under 200,000	Suburb	Rural	Good in Reading - Yes	Good in Reading - No	Good in Arithmetic - Yes	Good in Arithmetic - No	High Educational Emphasis	Low Educational Emphasis	All Students
Division of Whole Numbers																			
28	70%	76%	74%	72%	52%	70%	81%	65%	66%	77%	77%	77%	78%	65%	79%	62%	84%	62%	73%
29	39	43	41	41	21	34	50	32	36	46	45	45	46	33	50	26	54	31	41
30	56	60	58	58	35	52	67	50	50	62	62	63	63	50	65	45	69	47	58
31	51	59	55	55	31	50	65	44	47	60	61	60	61	46	64	40	69	42	55
*32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	29	35	31	32	14	26	39	25	27	36	32	35	37	23	40	18	44	24	32
34	29	35	33	32	13	26	41	22	26	37	35	36	37	25	40	19	44	24	32
35	30	36	33	33	14	26	41	25	25	38	34	37	38	24	41	18	46	24	33
36	30	36	32	33	14	25	41	25	25	38	33	36	38	24	41	18	46	23	33
37	57	65	60	62	41	52	71	56	53	66	67	60	68	50	69	48	75	47	[illegible]
Addition of Positive Fractions																			
38	34	37	33	38	16	24	46	29	34	39	39	33	42	25	42	24	51	24	[illegible]
39	25	24	22	27	11	15	32	21	21	27	27	23	29	17	30	15	36	17	24
40	12	15	13	14	7	8	18	12	11	15	12	16	17	9	18	6	22	8	14
41	72	78	74	75	57	73	82	69	68	79	76	80	80	68	80	67	85	65	75
42	17	18	15	18	7	9	23	15	15	18	20	18	21	11	22	7	28	10	17
43	15	17	15	17	6	9	22	13	14	18	18	17	20	10	21	7	27	10	16
44	24	24	23	25	9	15	32	20	20	27	24	28	29	17	31	12	37	15	24
45	13	13	12	14	4	6	18	11	11	14	14	14	16	7	17	5	23	7	13
46	13	13	12	14	4	6	18	11	10	14	13	13	16	7	17	5	23	7	13
Subtraction of Positive Fractions																			
47	43	54	47	49	35	44	54	46	43	51	50	53	54	[illegible]	55	38	59	39	48
48	12	14	12	14	6	8	17	10	11	15	13	14	16	8	17	6	22	7	13
49	8	10	9	9	3	5	12	6	8	11	8	10	11	5	12	3	16	5	9
50	10	8	8	9	2	4	12	7	7	10	9	10	11	5	12	3	15	5	9
51	7	6	6	7	1	3	9	5	5	7	7	8	8	4	9	2	13	3	7
Multiplication of Positive Fractions																			
52	19	22	17	23	12	12	26	19	19	21	25	19	24	13	25	11	32	13	20
53	0	1	0	1	1	0	1	1	0	1	0	1	1	0	1	0	1	0	1
54	3	3	3	3	1	1	4	2	3	3	2	5	4	1	4	1	5	2	3

* The test item did not measure the objective.

Objective Number	Male	Female	Title I	Non-Title I	Black	Mexican American	Other	City over 500,000	City 200,000 - 500,000	City under 200,000	Suburb	Rural	Good in Reading - Yes	Good in Reading - No	Good in Arithmetic - Yes	Good in Arithmetic - No	High Educational Emphasis	Low Educational Emphasis	All Students
Multiplication of Positive Fractions Continued																			
55	35%	41%	39%	37%	29%	39%	41%	34%	36%	41%	38%	38%	41%	33%	41%	33%	47%	33%	38%
56	21	23	22	22	19	19	25	21	18	24	21	24	25	19	25	18	26	18	22
57	11	9	9	11	5	6	13	9	8	11	11	9	12	7	12	6	14	7	10
58	1	2	1	1	1	0	2	1	1	2	0	1	2	1	2	1	3	1	1
59	1	1	1	1	0	0	1	1	1	1	0	2	1	1	1	0	2	1	1
Division of Positive Fractions																			
60	1	2	2	1	1	1	2	1	1	2	0	2	2	1	2	0	2	1	1
61	3	3	3	2	1	1	3	2	2	3	2	3	3	1	3	1	4	2	3
62	1	2	2	1	1	1	2	1	1	2	0	2	2	1	2	0	2	1	1
63	1	1	2	1	1	1	1	1	1	1	0	2	1	1	1	1	2	1	1
64	1	1	1	1	0	0	1	1	1	1	0	2	1	1	1	0	2	1	1
65	1	1	2	1	1	1	1	1	1	1	0	2	1	1	1	0	2	1	1
66	1	1	1	1	0	0	1	1	1	1	0	2	1	0	1	0	2	1	1
67	1	1	1	0	0	0	1	1	0	1	0	2	1	0	1	0	1	1	1
Addition of Decimal Fractions																			
68	3	3	4	3	2	2	4	3	3	4	3	4	4	2	4	2	5	3	3
69	64	70	66	68	42	62	76	58	61	71	74	69	70	62	72	59	78	56	67
70	60	66	61	64	38	58	72	53	57	67	69	62	67	57	69	53	74	52	63
71	54	61	56	58	35	53	66	48	50	62	64	59	61	52	63	48	69	46	57
*72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
73	44	53	48	49	27	45	56	40	41	52	56	49	52	43	54	40	61	38	48
74	52	61	56	57	34	53	65	48	49	61	63	57	61	51	63	47	67	47	57
Subtraction of Decimal Numbers																			
75	69	75	71	72	47	68	81	63	64	76	78	73	75	67	77	64	82	61	72
76	59	66	61	64	39	58	72	54	55	67	70	63	67	57	68	54	74	52	63
77	39	47	42	44	23	38	51	35	39	47	47	43	47	38	49	34	53	33	43
78	33	42	37	37	17	34	45	29	31	41	43	39	41	32	43	27	48	28	37
79	43	52	47	47	25	44	55	39	40	52	52	49	52	40	54	35	60	37	47

* The test item did not measure the objective.

Objective Number	Male	Female	Title I	Non-Title I	Black	Mexican American	Other	City over 500,000	City 200,000 - 500,000	City under 200,000	Suburb	Rural	Good in Reading - Yes	Good in Reading - No	Good in Arithmetic - Yes	Good in Arithmetic - No	High Educational Emphasis	Low Educational Emphasis	All Students
Multiplication of Decimal Numbers																			
80	35%	45%	40%	40%	19%	37%	48%	30%	34%	45%	44%	41%	43%	35%	45%	31%	50%	31%	[illegible]
81	29	36	32	33	13	29	39	22	28	36	37	34	35	28	38	23	41	24	[illegible]
82	26	34	29	30	12	26	36	21	26	34	34	31	33	25	35	20	37	23	[illegible]
83	31	34	34	31	28	33	34	30	28	34	33	36	34	31	33	32	35	29	[illegible]
84	5	7	6	5	4	4	7	5	5	6	4	8	6	4	7	3	8	4	[illegible]
85	3	5	5	3	2	3	5	3	3	4	2	5	5	3	5	[illegible]	6	3	4
86	10	13	12	11	8	10	13	9	10	12	11	14	13	9	13	8	14	9	[illegible]
87	8	10	9	8	4	8	10	7	9	10	6	11	10	[illegible]	10	6	12	7	9
Division of Decimal Numbers																			
88	57	64	61	60	38	57	68	52	50	65	65	62	64	55	66	51	70	50	60
89	29	34	31	31	16	26	38	26	26	35	31	34	36	24	38	20	42	23	31
90	0	0	1	0	0	0	0	0	0	0	0	2	0	0	1	0	1	1	0
91	1	2	2	1	1	1	2	1	1	2	1	2	2	1	2	1	2	1	1
92	30	38	34	34	18	30	41	28	27	38	38	38	38	28	40	23	43	26	34
93	4	6	5	5	2	3	7	4	3	6	4	6	6	3	7	2	8	3	5
94	1	2	2	1	[illegible]	2	1	2	2	1	2	1	1	2	1	2	1	2	1
95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	[illegible]
96	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	[illegible]
97	1	1	1	1	0	1	2	1	1	1	1	2	1	1	2	0	2	1	1
Negative Integers																			
98	37	42	39	40	23	32	47	32	32	43	47	44	43	34	44	33	48	[illegible]	39
99	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
100	14	13	14	12	15	16	12	14	14	12	14	14	13	12	13	13	12	14	13
101	37	44	41	40	29	37	46	36	34	43	46	46	43	37	44	35	46	33	40
Rounded Numbers (Estimation)																			
102	27	25	23	28	9	14	35	18	22	30	30	25	31	17	32	14	40	16	[illegible]
103	18	16	15	18	5	8	23	12	14	20	19	15	21	10	22	[illegible]	28	10	[illegible]
104	20	22	19	24	7	12	29	17	17	24	25	19	27	12	27	11	33	13	21
105	21	23	19	24	8	11	30	17	19	25	25	17	27	13	28	10	35	13	22
106	[illegible]	9	7	[illegible]	3	4	11	[illegible]	6	9	9	8	10	4	11	3	14	5	8
Commutative Property																			
107	29	34	30	33	[illegible]	23	[illegible]	28	28	[illegible]	[illegible]	29	[illegible]	24	38	[illegible]	44	[illegible]	32
108	34	41	[illegible]	38	[illegible]	18	47	[illegible]	31	41	44	34	43	29	44	[illegible]	51	25	[illegible]

Objective Number	Male	Female	Title I	Non-Title I	Black	Mexican American	Other	City over 500,000	City 200,000 - 500,000	City under 200,000	Suburb	Rural	Good in Reading - Yes	Good in Reading - No	Good in Arithmetic - Yes	Good in Arithmetic - No	High Educational Emphasis	Low Educational Emphasis	All Students
Associative Property																			
109	38%	48%	42%	44%	26%	35%	51%	39%	36%	46%	50%	38%	48%	34%	50%	32%	57%	32%	43%
110	33	42	36	38	20	29	46	32	31	41	43	33	43	28	44	26	51	26	37
Distributive Property																			
111	30	37	33	34	22	27	40	30	25	37	37	33	38	28	39	25	44	25	34
112	35	43	38	39	26	31	45	36	32	42	43	35	44	31	45	29	50	28	39
Identity Element																			
113	68	75	71	71	50	66	81	64	59	76	79	73	77	63	77	63	83	58	71
114	52	59	55	56	39	51	63	49	48	60	62	56	61	48	62	46	66	44	56
115	63	68	65	65	45	57	75	59	54	70	71	64	71	58	72	56	78	52	65
116	45	51	47	49	33	42	55	43	41	52	53	48	53	41	54	39	59	36	48
Inverse Relation																			
117	51	59	54	56	33	46	66	50	47	60	62	54	62	46	63	43	70	41	55
118	18	24	21	21	14	19	24	21	18	22	21	19	23	19	24	17	26	14	21
Number Sequences (Linear Functions)																			
119	42	47	41	47	21	34	55	37	37	49	53	40	50	35	51	33	60	31	44
120	18	16	16	18	5	10	23	12	12	19	19	19	21	11	21	10	28	11	17
121	31	26	27	31	10	18	38	23	24	32	34	28	34	20	35	17	43	19	29
122	61	71	66	66	44	61	76	60	55	71	73	67	72	58	72	58	79	52	66
123	51	56	52	55	29	43	65	46	44	59	62	51	60	43	62	41	70	39	54
124	5	5	4	6	1	2	7	4	4	6	6	4	7	3	7	2	10	3	5
125	16	16	15	18	5	8	23	13	13	18	19	15	20	10	21	9	27	9	16
Missing Addends and Factors (Transform)																			
126	52	63	58	58	39	53	66	51	51	62	64	60	64	49	64	48	70	46	58
127	51	61	55	56	33	50	65	48	48	61	62	56	61	49	62	46	68	44	56
128	26	32	28	29	20	26	33	27	24	31	28	30	32	23	34	20	37	22	29
129	2	5	3	4	2	2	5	4	3	4	4	4	5	2	5	2	7	2	4

Objective Number	Male	Female	Title I	Non-Title I	Black	Mexican American	Other	City over 500,000	City 200,000 - 500,000	City under 200,000	Suburb	Rural	Good in Reading - Yes	Good in Reading - No	Good in Arithmetic - Yes	Good in Arithmetic - No	High Educational Emphasis	Low Educational Emphasis	All Students
Number Theory																			
130	1%	1%	1%	1%	0%	0%	1%	1%	0%	1%	1%	1%	1%	1%	1%	1%	2%	0%	1%
131	2	2	1	3	1	1	3	3	2	2	3	2	3	1	3	1	5	1	2
132	56	63	58	61	34	50	72	53	49	65	67	58	67	50	67	49	73	45	60
Mathematical Sentences																			
133	20	22	19	23	6	12	29	15	18	24	23	21	26	13	27	12	34	12	21
Measurement																			
134	42	42	39	44	18	31	54	34	35	46	50	41	48	32	49	31	58	30	42
135	28	28	26	30	11	19	36	23	23	31	33	28	32	20	33	20	39	19	28
136	24	26	23	26	9	17	32	20	21	28	28	22	29	17	29	18	36	16	25
137	44	38	38	43	13	29	54	32	34	45	51	39	47	31	48	30	57	28	41
138	34	29	30	33	9	20	42	23	24	36	36	34	37	22	39	18	46	20	31
139	5	4	4	5	1	2	6	3	4	5	5	4	6	2	6	1	8	2	4
140	39	36	36	39	16	28	48	30	29	43	43	37	43	29	44	27	51	26	38
141	6	5	5	6	1	2	7	4	5	6	5	5	6	3	7	2	10	4	5
142	29	28	25	31	9	17	38	21	24	32	36	25	33	21	34	19	42	18	28
143	28	25	24	29	10	17	35	20	22	30	34	23	30	21	31	18	38	18	27
144	8	4	4	7	1	3	8	5	7	7	6	7	7	3	7	3	10	5	6
145	40	46	41	45	23	34	53	38	36	47	48	41	49	34	48	35	55	31	43
146	56	60	58	58	45	57	63	55	51	61	61	60	61	53	62	53	63	51	58
147	56	66	61	61	42	59	68	54	52	66	65	64	65	55	66	53	71	51	61
148	57	67	62	61	46	60	68	57	52	66	66	65	66	56	66	56	70	52	62
149	55	65	60	60	40	56	68	53	50	65	65	64	65	53	66	51	70	49	60
150	12	16	15	14	6	10	18	10	9	17	13	17	17	9	19	6	21	9	14
151	40	35	37	38	18	28	47	31	28	42	37	43	43	29	45	25	48	26	38
152	39	34	36	37	16	29	46	30	28	41	37	40	42	28	44	23	49	25	36
153	26	29	28	27	20	26	31	25	22	30	28	30	31	23	31	23	34	23	28
154	49	48	49	48	31	41	57	42	36	54	46	56	55	39	56	37	60	37	48
*155	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
156	6	5	5	6	1	3	8	5	4	6	6	6	7	3	8	1	10	3	6
157	56	59	56	59	28	50	69	50	49	62	65	58	64	48	65	46	72	44	57
158	15	11	11	15	3	6	18	10	12	14	14	12	16	8	17	5	22	8	13
159	17	14	14	17	6	9	20	12	13	18	16	1[illegible]	19	10	20	7	25	10	15
160	32	34	31	35	15	22	43	29	26	36	38	32	39	24	39	22	47	22	33

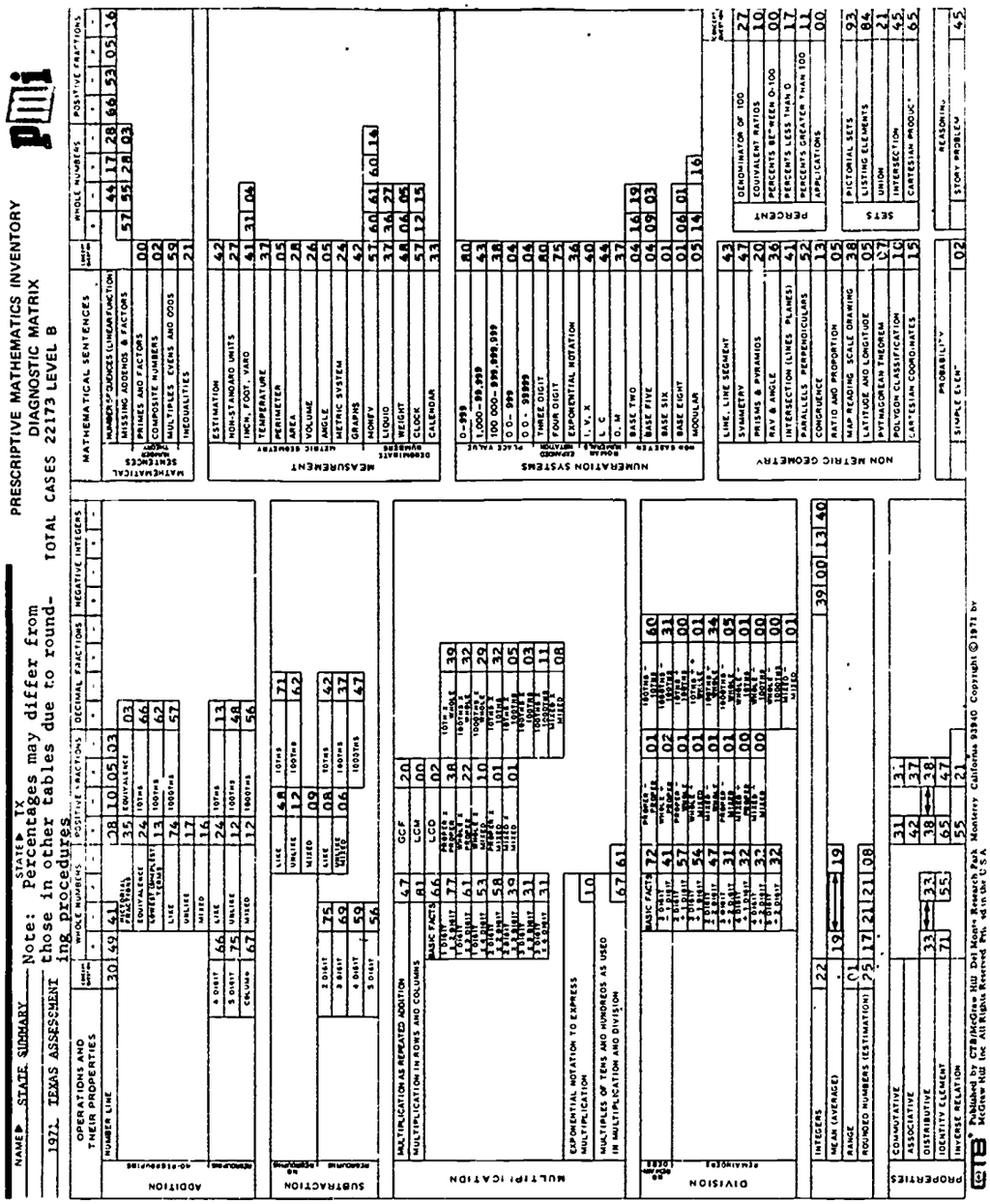
* The test item did not measure the objective.

Objective Number	Male	Female	Title I	Non-Title I	Black	Mexican American	Other	City over 500,000	City 200,000 - 500,000	City under 200,000	Suburb	Rural	Good in Reading - Yes	Good in Reading - No	Good in Arithmetic - No	Good in Arithmetic - Yes	High Educational Emphasis	Low Educational Emphasis	All Students
Place Value																			
161	79%	83%	79%	82%	69%	74%	87%	77%	79%	83%	87%	75%	86%	73%	85%	74%	88%	71%	81%
162	44	42	39	46	31	33	51	44	38	45	50	35	49	34	49	33	54	33	43
163	39	38	34	42	27	29	46	40	34	40	46	31	44	30	45	28	50	28	39
164	4	5	4	5	3	3	6	7	5	4	4	5	6	3	6	3	8	3	5
165	4	4	4	4	2	2	5	4	4	4	4	4	5	3	5	2	7	3	4
166	80	82	79	82	62	74	89	76	76	83	88	79	85	74	86	72	91	70	81
167	75	76	74	77	56	67	85	69	71	79	83	74	81	68	82	66	87	64	76
168	34	40	34	39	28	29	43	35	30	39	41	37	41	31	42	28	47	29	37
Numeration Systems																			
169	42	39	40	41	28	33	47	41	37	43	37	39	45	33	48	27	51	32	41
170	45	44	45	44	34	36	51	44	37	48	39	46	49	37	51	32	55	35	44
171	39	37	38	38	26	28	45	37	33	41	34	37	43	30	45	25	49	29	38
172	4	5	3	5	4	2	5	4	5	4	6	6	5	3	5	2	6	4	4
173	15	17	14	18	8	10	21	11	15	17	20	21	19	11	20	10	24	12	16
174	20	20	19	20	16	16	23	16	21	20	24	23	21	18	22	17	25	17	20
175	5	5	4	6	2	2	6	4	6	5	5	7	6	3	6	2	8	4	5
176	10	10	9	10	3	6	13	4	9	11	9	16	11	6	12	4	15	7	10
177	4	4	4	4	3	2	5	4	3	4	4	5	4	3	5	2	6	2	4
178	1	2	1	2	0	1	2	1	1	2	2	2	2	1	2	0	3	1	1
179	2	2	2	2	1	1	3	1	1	2	3	2	2	1	3	1	4	1	2
180	6	6	6	6	2	3	8	2	5	7	6	9	7	3	8	2	10	4	6
181	2	1	2	2	1	0	2	1	1	2	2	2	2	1	2	0	3	1	2
182	5	6	6	6	7	5	6	5	6	6	6	6	6	5	6	6	6	6	6
183	13	17	15	15	11	12	17	12	14	16	17	15	15	14	16	11	18	12	15
184	14	18	15	17	9	13	19	13	15	18	21	15	17	14	19	11	21	13	16
Non-metric Geometry																			
185	46	49	48	46	34	47	52	44	40	50	47	52	50	44	50	44	54	41	47
186	4	6	5	5	3	4	6	4	5	6	6	6	5	5	6	4	6	4	5
187	41	45	43	44	25	34	52	35	36	48	47	42	49	34	48	35	57	33	43
188	19	21	19	21	13	14	24	16	19	22	21	21	23	15	22	17	27	16	20
189	37	37	36	37	17	25	47	27	28	43	41	34	42	28	42	28	51	26	37
190	39	43	39	43	24	30	50	34	34	45	45	42	48	28	46	33	56	31	41
191	49	56	51	53	31	41	63	42	44	58	56	56	59	40	58	43	68	40	52
192	13	15	13	15	8	11	16	12	12	15	14	13	15	10	15	11	18	11	14
193	8	8	8	8	7	7	8	8	6	8	7	8	8	8	8	8	8	7	8
194	11	10	11	11	11	12	10	11	9	11	9	13	10	11	11	11	10	11	11
195	38	39	36	41	15	28	50	32	30	43	43	38	46	27	46	25	53	25	38
196	6	5	4	7	2	2	8	4	5	6	9	3	7	3	7	3	10	3	6
197	16	16	13	18	4	9	21	12	14	17	21	13	18	11	19	10	25	10	16

Objective Number	Male	Female	Title I	Non-Title I	Black	Mexican American	Other	City over 500,000	City 200,000 - 500,000	City under 200,000	Suburb	Rural	Good in Reading - Yes	Good in Reading - No	Good in Arithmetic - Yes	Good in Arithmetic - No	High Educational Emphasis	Low Educational Emphasis	All Students
Percent																			
198	26%	29%	27%	27%	16%	20%	34%	25%	20%	30%	27%	28%	32%	20%	31%	21%	38%	19%	27%
199	12	8	9	11	2	4	15	8	8	11	11	11	13	5	13	4	19	5	10
200	1	1	1	1	0	1	1	0	0	1	0	1	1	0	1	0	1	1	1
201	15	19	17	18	10	14	21	16	14	19	16	17	20	13	20	13	25	12	17
202	10	13	11	12	9	10	13	12	10	13	10	11	14	9	13	9	16	8	12
203	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Sets																			
204	93	94	93	94	91	91	95	94	91	94	94	95	95	92	95	92	96	91	94
205	84	85	83	86	72	79	91	82	84	86	88	86	88	79	88	80	92	77	85
206	21	22	21	22	13	17	26	22	20	23	20	21	24	17	25	16	28	[illegible]	22
207	42	48	39	51	39	37	50	56	43	44	48	40	50	37	50	38	54	38	45
208	66	66	62	70	45	51	77	63	60	.68	74	63	72	55	72	57	80	52	66
Statistics																			
209	20	20	19	21	6	11	27	14	14	23	22	21	25	11	25	10	33	11	20
210	1	1	1	1	C	0	2	1	1	1	1	2	2	1	2	0	2	1	1
Probability																			
211	2	2	2	2	1	1	3	2	2	3	2	3	2	2	3	2	3	2	2
Reasoning																			
212	45	46	44	46	26	35	56	38	38	50	50	46	52	36	52	36	59	34	45

APPENDIX G

STATE SUMMARY CHART OF PUPIL PERFORMANCES



APPENDIX H

SUMMARY OF REPLIES TO EVALUATION INSTRUMENTS

SURVEY FORM FOR SCHOOL CONTACT PERSONS

This instrument was provided to the assessment contact persons in education service centers for use in pre-test workshops for school personnel. These results were obtained from 192 participants in the nine ESC regions that reported.

- 92% of the workshop participants indicated that they had no previous exposure to criterion-referenced testing.
- 87% considered the idea of a criterion-referenced assessment very appealing and they thought the results would be useful in planning classroom instruction.
- 85% responded that they believed test results based on measurable objectives would be useful for tailoring programs to the continuous progress of pupils in the participants' schools.
- 95% thought criterion-referenced measures would give more information to teachers about students than norm-referenced tests.
- 68% of the participants were confident of their ability to explain criterion-referenced concepts to another person or to implement the test results.

SURVEY OF TEACHER OPINION I

A survey questionnaire was distributed in October 1971 through the ESC assessment contact person to sixth-grade mathematics teachers in a sample of the schools participating in the assessment project. The survey was conducted during this phase of the assessment to gather a series of initial reactions to the assessment procedures and instruments after they had been administered and before results from the assessment instruments had been returned to the schools. The following results were the opinions of 213 respondents from the statewide sample of teachers.

- 96% stated that this was their first experience with criterion-referenced testing.

- 71% of the teachers felt that they understood the principles of criterion-referenced testing in a range from satisfactory to very well.

- 60% of the teachers thought the test results would be useful or very useful for planning classroom instruction.

- 70% thought they were adequately prepared to make use of the test results.

- When asked about the method by which they would prefer to receive information about test administration if they participated in another assessment, 31% checked "printed materials only," 39% checked "conversation" or "group discussion," 21% indicated a preference for "lecture with audio-visual equipment," and only 2% wanted just "lecture."

- In response to the question, "If you were planning to prepare teachers for participation in next year's assessment project, which items would you stress in your presentation?", 59% felt information on the use of the test data was important, 42% stated "explanation of criterion-referenced tests" should be stressed, 40% of the teachers checked "test administration detail," and 12% checked "time schedules and deadlines."

EVALUATION FORM - POST-TEST WORKSHOP

An evaluation form was distributed to school personnel who attended post-test workshops in each of the 20 ESC regions during January 1972. The participants were asked about how well they thought the objectives for the workshops were met. The form contained a five-point scale with one being the lowest. The mean score of the participants' ratings are given in parentheses after each objective. (5 = highest possible score)

- Information about the rationale for the assessment project (4.2)

- Awareness of the implications of criterion-referenced testing, the rationale for comparing classroom objectives, and the objectives measured by the test instruments (4.1)

- Awareness of the potential of criterion-referenced test results for promoting the continuous progress of pupils (4.3)

- Gaining skills in using the diagnostic and prescriptive information from criterion-referenced tests for identifying pupil learning needs (4.0)

- Understanding of how to use these results to plan instruction for individuals and groups of pupils (4.0)

SURVEY OF TEACHER OPINION II

The final questionnaire for this evaluation procedure was distributed to sixth-grade mathematics teachers in the same sample of schools that were selected for the first "Survey of Teacher Opinion," in February 1972. This survey was distributed at this time to secure teacher reactions about the total assessment project after most of them had the opportunity to study and use the results from the criterion-referenced tests.

Of the 254 respondents to the survey, 24% were replying after receiving results from the Prescriptive Mathematics Inventory (PMI), only 29% in reference to the results from the Prescriptive Reading Test (PRT), and 47% after receiving results from both tests.

- When asked if the results were particularly helpful in classroom instructional planning - 43% replied no, 57% replied yes. Of the "no" replies, most responded: the results arrived too late (33% gave this as one reason for responding "no"), the results were not adaptable to their classroom situations, and the test(s) were not appropriate for their classes, so the results were not meaningful. Of the teachers marking "yes", most gave: "identifying pupil weaknesses in skills, identifying areas of the curriculum needing study, and identifying special pupil abilities" as their reasons for replying in this manner. Another question on the survey asked the teachers to rate the usefulness of criterion-referenced test results for classroom instructional planning and the mean of the rating was 4.4 on a six point continuum (six was the highest possible rating).

- When asked if the test information was adequate for the teacher's purposes - 23% responded no, 72% responded yes. Of the "no" replies, comments indicated that the primary reasons for this response were the late arrival of results which caused them to be less useful, the tests were too difficult for some groups of students, and the test information did not fit the teachers' classroom situations.

- When asked if the benefits derived from the assessment were sufficient to justify the school time devoted to participation - 23% replied "no", 52% "yes", and 25% "did not know."

- When teachers were asked to respond to hypothetical situations involving diagnosis of pupils' learning skills and were asked to rank a list of alternatives for achieving the diagnosis, they ranked standardized criterion-referenced

testing as their first choice for determining individual differences to plan instruction early in the school year and for evaluating the degree to which the pupils had attained the larger outcomes of the course near the end of the school year. The teachers ranked teacher-made testing as a first choice for determining the degree to which students had mastered learning tasks at midyear and teacher-made criterion-referenced testing as a first choice as a means of obtaining evaluative data on pupil mastery of overall course outcomes for grading and reporting purposes.

- When teachers were asked to rate the extent to which the various forms in which test results were reported to schools assisted teachers, they responded: The Diagnostic Matrix for Individual Pupils and Individual Study Guides provide the most assistance; the Master Reference Guide was of least assistance.

- When asked to compare the results of criterion-referenced testing to the results of norm-referenced testing for instructional planning, the teachers gave criterion-referenced testing a mean of 3.17 on a 4 point continuum.

- When asked about revisions in the test instruments, the major change recommended by teachers for both tests was simplification of the vocabulary used in test questions and, in the case of the PMI, to revise the way pupils record their answers.

- When asked about the best procedures for administering tests of this type in the future, about 65% of the teachers responded that they would administer the test in the regular classroom and about the same percentage indicated that they would prefer to administer them in the morning.

- When asked about the helpfulness of post-test workshops 83% reported that the workshops had been of help to them.

Errata - SIXTH GRADE MATHEMATICS, A Need Assessment Report

1. In the Sixth Grade Mathematics Needs Assessment Report the percentage of students mastering each objective has been reported incorrectly for the objectives grouped under the heading Non-metric Geometry, objective numbers 185-196. The following table gives the corrected percentage of students mastering each objective for Appendix E, pages 101-103, of this report. This corrected table also serves as a reference for the corrected percentage of mastery for any discussion of student attainment of these objectives in the body of the text.

NON-METRIC GEOMETRY

Obj. No.	Corrected % of students mastering each objective
185 - line segment	43%
186 - symmetry	47%
187 - prism	20%
188 - ray	37%
189 - intersection (lines and planes)	41%
190 - parallel lines	52%
191 - congruence	14%
192 - ratio and proportion	5%
193 - map reading, scale drawing	38%
194 - latitude and longitude	6%
195 - Pythagorean theorem	8%
196 - polygon classification	11%

A corrected table giving the percentages of mastery by population groups, Appendix F, for the Non-metric Geometry objectives, objectives numbers 185-196, page 113, can be obtained by contacting the Division of Program Planning and Needs Assessment, Texas Education Agency, 201 East 11th Street, Austin, Texas 78701.

2. Objective number 44, page 83, should have an asterisk by the side of the number indicating it was selected as a basic objective.

MATHEMATICS RESULTS BY POPULATION GROU

Objective Number	Male	Female	Title I	Non-Title I	Black	Mexican American	Other	City over 500,000	City 200,000 - 500,000	City under 200,000	Subu	
Non-metric Geometry												
185	41	45	43	44	25	34	52	35	36	48	47	4
186	46	49	48	46	34	47	52	44	40	50	47	5
187	19	21	19	21	13	14	24	16	19	22	21	2
188	37	37	36	37	17	25	47	27	28	43	41	3
189	39	43	39	43	24	30	50	34	34	45	45	4
190	49	56	51	53	31	41	63	42	44	58	56	5
191	13	15	13	15	8	11	16	12	12	15	14	1
192	4	6	5	5	3	4	6	4	5	6	6	
193	38	39	36	41	15	28	50	32	30	43	43	3
194	6	5	4	7	2	2	8	4	5	6	9	
195	8	8	8	8	7	7	8	8	6	8	7	
196	11	10	11	11	11	12	10	11	9	11	9	1

HEMATICS RESULTS BY POPULATION GROUPS

GROU		Black	Mexican American	Other	City over 500,000	City 200,000 - 500,000	City under 200,000	Suburb	Rural	Good in Reading - Yes	Good in Reading - No	Good in Arithmetic - Yes	Good in Arithmetic - No	High Educational Emphasis	Low Educational Emphasis	All Students
7	4	34	52		35	36	48	47	42	49	34	48	35	57	33	43
7	5	47	52		44	40	50	47	52	50	44	50	44	54	41	47
1	2	14	24		16	19	22	21	21	23	15	22	17	27	16	20
1	3	25	47		27	28	43	41	34	42	28	42	28	51	26	37
5	4	30	50		34	34	45	45	42	48	28	46	33	56	31	41
6	5	41	63		42	44	58	56	56	59	40	58	43	68	40	52
4	1	11	16		12	12	15	14	13	15	10	15	11	18	11	14
6		4	6		4	5	6	6	6	5	5	6	4	6	4	5
3	3	28	50		32	30	43	43	38	46	27	46	25	53	25	38
9		2	8		4	5	6	9	3	7	3	7	3	10	3	6
7		7	8		8	6	8	7	8	8	8	8	8	8	7	8
9	1	12	10		11	9	11	9	13	10	11	11	11	10	11	11